UNIVERSITY OF CALIFORNIA

Santa Barbara

Tracking Identity: Opportunity, Success, and Affiliation with Science among Fifth-Grade Latina/o Youth of Santa Barbara, California

A dissertation submitted in partial satisfaction of the

requirements for the degree Doctor of Philosophy

in Anthropology

by

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September 2015

The dissertation of Grayson Ford Maas is approved.

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Finally, I humbly thank the students, parents, teachers, and administrators of Amblen Elementary for sharing their stories and their time with me. I am forever grateful to you all.

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Ph.D., Anthropology, University of California Santa Barbara, CA (2015)
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2013 - 2015 ***Principal Investigator*, grants obtained from the University of California Institute for Mexico and the United States (UC MEXUS) Dissertation Grant, and the University of California Santa Barbara (Chicano Studies Institute Doctoral Dissertation Research Grant, Graduate Opportunity Fellowship, Dean's Advancement Fellowship, Sociocultural Graduate Student Research Grant, and Humanities & Social Sciences Research Grant)**

- Designed, wrote, and carried out research grants and was responsible for managing budgets and producing regular progress reports
- Designed and carried out doctoral research analyzing the social and psychological impacts of ability grouping (i.e., tracking), as well as the levels of affiliation with science as a potential career, among fifth-grade Latino youth in Santa Barbara, CA
- Honed skills as an ethnographer, including use of participant observation, focus groups, structured and semi-structured interviews, as well as drawing, free-list, and rank-order exercises, etc.
- Generated recommendations for teachers, school, and community designed to facilitate deeper commitments to improving educational outcomes for students, teachers, parents, and others

2013 – 2015 ***Associate Editor,* The Journal of Environment & Development**

- Analyzed and reviewed international submissions for publication, in keeping with the journal's aims and scope (i.e., "to further research and debate on the nexus of environment and development issues at the local, national, regional, and international levels")

- Regularly collaborated with team members to provide recommendations about forwarding, revising, or rejecting submissions for peer review on the basis of an article's collective strengths and/or weaknesses
- Applied analytical skill set in assessing the strength of each submission's novelty, timeliness, methodological core, theoretical framework, references to literature, organization, and writing
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2013 – 2015 ***Council Member/Representative,*** **Council for Faculty Issues & Awards, University of California Santa Barbara, CA**

- Campus representative for all graduate students
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- Voted on issues and provided formal commentary about issues to Academic Senate
- Responsible for regular reporting to Graduate Student Association about issues that were of most crucial importance to graduate students
- On behalf of graduate student body, generated specific set of comments and feedback for Task Force on Utilizing Technology to Enhance Student Learning

2015 ***Teaching Associate/Instructor of Record*****, Department of Anthropology, University of California Santa Barbara, CA**

- Course title: *Anthropology of World Systems*
- Created and implemented upper-division undergraduate course centered on globalization (and the global capitalist economy characteristic of it) and how it shapes local educational practices and discourse the world over, with special emphasis on the United States education system from elementary school through college
- Designed and delivered daily lectures on a wide range of topics including education, globalization, Neoliberalism, social change, opportunity, social mobility, culture, gender, ethnicity, identity, and development

- Responsible for creating and implementing systems for student evaluation and formally submitting student course grades to University Registrar
- Worked with diverse groups of students and learning styles and utilized variety of communication and teaching approaches (e.g., traditional lectures, interactive feedback using various technologies, student-centered discussion, audiovisual analysis, etc.) to most effectively reach all students
- Worked to encourage, guide, and mentor students in developing creative and critical thinking skills to inspire and empower students to use knowledge and insight gained as a platform to further investigate topics of their own personal interest

2010 – 2015 ***Teaching Assistant*, Departments of Anthropology, Geography, and Environmental Studies, University of California Santa Barbara, CA**

- Course titles:
  - *Introductory Cultural Anthropology* (four times)
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  - *Global Food Systems and Human Food Security* (once)
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- Responsible for recording, maintaining, and submitting students' course grades to instructor of record and University Registrar
- Worked with diverse groups of students and learning styles and utilized variety of communication and teaching approaches (e.g., traditional lectures, interactive feedback using various technologies, student-centered discussion, audiovisual analysis, etc.) to most effectively reach all students
- Worked to encourage, guide, and mentor students in developing creative and critical thinking skills to inspire and empower students to use knowledge and insight

gained as a platform to further investigate topics of their own personal interest

INTERNATIONAL FIELD EXPERIENCE

2009 **Mongolia**

- Selected as one of six University of Pennsylvania undergraduate students to collaborate with the Mongolian Academy of Sciences, the Mongolian University of Science and Technology, the National University of Mongolia, and the Academy of Natural Sciences in Philadelphia, as part of a research grant from the National Science Foundation Partnerships for International Research and Education (PIRE)
- Studied the combined ecological and evolutionary consequences of global climate change in northern Mongolia
- Analyzed the legacy effect that nomadic herders' circular, 18-foot, wooden-framed, felt homes (*gers*) had on the plant communities in the Dalbay Valley at the northern end of Lake Khuvsgul
- Perform species identification undertakings and established presence-absence ratios for the species found growing inside the *ger* imprints compared to those found directly outside of the *ger* imprints
- Learned about how political circumstances influence the cultural fabric of people, which in turn impacts how they live on a daily basis and how they impact the environment

2008 **Kenya**

- Participated in School for Field Studies Community Wildlife Research Program in rural southern Kenya (Kimana, Oloitokitok District) with 14 other undergraduates from across nation
- Assessed perceptions of wildlife conservation and environmental awareness among the younger generations (i.e., youth from primary and secondary schools) of southern Kenya through series of in-depth surveys and interviews
- Gained firsthand insight about how differences in individual’s perceptions translate into variations in human activity, resource management, and

interpretations of the role humans have in protecting natural resources
- Generated research reports and recommendations to help Kenyan government formulate practical conservation strategies for rural communities

SELECTED FELLOWSHIPS, GRANTS, & HONORS

2015 Graduate Opportunity Fellowship
2015 Outstanding Teaching Assistant Award Nomination (twice)
2013
2014 Dean's Advancement Fellowship
2014 University of California Institute for Mexico and the United States (UC MEXUS) Dissertation Grant
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2013 Chicano Studies Institute Doctoral Dissertation Research Grant
2013 Humanities & Social Sciences Research Grant
2013 Doctoral Student Travel Grant
2013 Graduate Students' Association Travel Grant
2013 Graduate Students' Association Excellence in Teaching Award Nomination
2010 Dean's List, University of Pennsylvania (twice)
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SELECTED PRESENTATIONS & REPORTS

2015 "Who gets to be a Scientist?" A presentation given at the annual *Friends of Anthropology* event, Santa Barbara, CA
2014 "Underrepresentation in Science Education: A Tale of Structural Inequality and Identity." A presentation given at the *Fields of Inquiry* Conference, UC Berkeley Center for Science, Medicine, Technology, & Society
2014 "Beyond the Numbers: Underrepresentation in Science and the Case for Identity." A presentation given at the *Destinations* Conference, Society for Applied Anthropology, Albuquerque, NM
2014 "Numbers DO Lie: Rethinking Inequality and the Achievement Gap." A presentation given at the annual *Graduate Student Showcase*, University of California, Santa Barbara, CA
2014 "How to Code Qualitative Data in MAXQDA." A presentation given at the University of California, Santa Barbara, CA
2013 "Underrepresentation in Science Education: A Tale of Structural Inequality and Identity." A presentation given at the annual *Anthropology Graduate Student Symposium*, University of California, Santa Barbara, CA

2013 "Culture, Language, and Race…and Deficits: The Plight and Resilience of Latina/o Youth in the United States Education System." A research report given at the University of California, Santa Barbara, CA

2013 "Identity and the Politics of Underrepresentation in Science Education." A research report given at the University of California, Santa Barbara, CA

2013 "Science Identity: What Is It, and Why Does It Matter?" A presentation given at the annual *Graduate Student Showcase*, University of California, Santa Barbara, CA

2012 "Discourse Analysis: A Presentation of the Very Basics." A presentation given at the University of California, Santa Barbara, CA

2012 "Constructing Boundaries: The Role of Science in California State-Sponsored Wildlife Conservation Education Programs." A presentation given at the University of California, Santa Barbara, CA.

2011 "The Intersections of Nature, Power, and Science in the Santa Barbara Museum of Natural History." A presentation given at the University of California, Santa Barbara, CA

2009 "After-School Environmental Clubs in Kenya: What are the Students *Really* Learning?" A presentation given at the University of Pennsylvania, Philadelphia, PA

ADDITIONAL PROFESSIONAL & SERVICE ACTIVITIES

2015 *Visiting Scholar*, Max Planck Institute for the History of Science, Berlin, Germany

2014 *Panel Member/Speaker*, "Alumni in Education" Alumni Association event, University of California Santa Barbara, CA

2013 – 2014 *Committee Chair*, Environmental Studies Senior Thesis, University of California Santa Barbara, CA

2013 – 2014 *Docent*, Cheadle Center for Biodiversity and Ecological Restoration

2013 & 2014 *Invited Participant*, W.E.B. Du Bois Symposium for Educational Opportunity, University of California Santa Barbara, CA

2012 – 2013 *Committee Member*, Environmental Studies Senior Thesis, University of California Santa Barbara, CA

2012 & 2013 *Panel Member*, Prospective Graduate Student Reception, Department of Anthropology, University of California Santa Barbara, CA

2010 *Guest Speaker*, Newly Admitted Students Reception, University of Pennsylvania, Philadelphia, PA

2009 *Conference Organizer*, American Anthropological Association annual meeting, Philadelphia, PA

ASSOCIATIONS & MEMBERSHIPS

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American Anthropological Association
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Ethnography and Cultural Studies Research Focus Group, University of California Santa Barbara
University of California Santa Barbara Alumni Association
University of Pennsylvania Alumni Association
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ABSTRACT

Tracking Identity: Opportunity, Success, and Affiliation with Science among Fifth-Grade Latina/o Youth of Santa Barbara, California

by

Grayson Ford Maas

This dissertation is an investigation into the American public education system at the elementary school level. It highlights important factors that shape the organizational structure of schools and classrooms, and in turn, how they engender disparities in the ways students experience education, namely, in the opportunities made available to them to achieve and succeed at a high level. This dissertation operates at the confluence of notions about class, gender, language, and race, especially as they revolve around public education and the hegemonic meritocratic discourse on which it is founded. This dissertation engages and contributes to scholarship within the following areas: The political economy of education; discourse and the dialectical relationship between agency and structure; cultural perspectives on identity, voice, and learning; and, Latinas/os in science education.

The data that serve as the basis for the findings presented in this dissertation were collected throughout a three-phase yearlong ethnographic study of the two tracked fifth-grade classrooms at Amblen Elementary School, serving a socioeconomically disadvantaged Latina/o student population in Santa Barbara, California.

In classrooms all across the nation, while it remains true that Latina/o students disproportionally take up space in the lower-tracked courses and not in the higher ones, this study does not examine inequality in tracking assignments made along ethnic/racial lines (as 100% of the students that participated in this research identify as Latina/o), rather, it investigates the consequences of what happens when Latina/o students are tracked according to symbolic markers of their ethnic/racial identity, that is, their varying levels of English language competency.

Using data from participant observation, semi-structured interviews, students' drawings, as well as free-list and rank-order exercises, I was able to answer the following central research questions: In what ways do the division of students into groups (based on academic ability [i.e., English language proficiency] and behavior) impact: (a) the number and types of opportunities for Latinas/os to succeed in school science? (b) how Latinas/os negotiate the concept of 'success' in school science? And (c) the ways in which Latinas/os claim and perform successful school science identities?

During my time with the fifth-grade youth of Amblen Elementary School, I found that not all students were necessarily expected to succeed in the same ways and with the same frequency. I also found that while there existed considerable overlaps, what it meant to be a “good” science student in one classroom was qualitatively different from what it meant in the other. Importantly, these differences in classroom expectations helped to mold (or inhibit) students’ individual understandings of self as capable and/or “smart” students. This dissertation endeavors to tell their story.

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1. CHAPTER ONE: Introduction

1.1. Problem Statement

In the United States, Latina/o Americans are the most underrepresented minority group in STEM (i.e., science, technology, engineering, and mathematics) education and in the workforce, but especially in science (NSF, 2015). Latinas/os account for only 5.8% of the United States science workforce—while Latin*as* account for just 2.4% of the science workforce—despite representing 16.9% of our national population (NSF, 2015). Compared to the other two largest minority groups in the United States (i.e., African Americans account for 5.2% of the science workforce while representing 12.3% of the national population; and, Asian Americans account for 18.2% of the science workforce while representing just 5.0% of the national population), the gap in representation in the sciences is most pronounced for Latinas/os (NSF, 2015). Similarly, of all science degrees awarded in 2012 (731,878 in total), only 9.7% of these degrees were awarded to Latinas/os, and further still, Latina/o underrepresentation increases when correlated to degrees awarded while moving through higher education (Chapa & De La Rosa, 2006): associate's (14.7%); bachelor's (10.1%); master's (6.3%); doctoral (4.3%) (NSF, 2015).

What are we to make of these numbers? Despite decades of debate and scholarship on the topic, underrepresentation continues to exist as an

indicator of inequality. Mainstream education policy frames the issue as an "achievement gap" problem, citing Latina/o and other minority students' persistent lower levels of performance on national- and state-level assessments relative to their White counterparts (NRC, 2012). Indeed, individual achievement scores tied to content standards (i.e., an agreed upon—at both the state and national levels—collection of scientific facts and concepts deemed important and necessary to achieve "science literacy" as one progresses through K-12 education) remain *the* predominant metric for interpreting successful learning outcomes in the United States (Tan & Calabrese Barton, 2008b). However, it is worth questioning the assumption that if *all* students performed equally well on standardized exams, underrepresentation would cease to exist in higher education or in the workforce. To better understand some of the mechanisms of underrepresentation, we must look beyond the numbers, and investigate the role of schools—their organization and their structure—in the perpetuation of underrepresentation, and particularly, how they shape student experiences and the opportunities to succeed in science.

One contentious issue is the widespread practice of tracking, which is the intentional division of students into permanent and usually hierarchical groups (e.g., "high" tracks and "low" tracks, etc.) within a school, most commonly based on one's perceived intellectual capabilities (Oakes, 2005). Dating back at least one century, there have existed several modes of

tracking in the United States, with many attempts to do so being guided by racist ideologies which had segregated schools and classroom until the landmark 1954 Supreme Court ruling in *Brown v. Board of Education* that segregation in education was unconstitutional. Since then, tracking has continued to persist in primary and secondary schools, and the decision to do so is left largely to the discretion of individual school administrators and teachers. While track assignments can be based on non-academic factors, including scheduling conflicts and/or behavioral dispositions, the overwhelming majority of track assignments are based upon students' academic performance (Oakes, 2005).

Historically, minority students have been disproportionally *over*represented in the lower, more basic tracks (Oakes, 2005; Valencia, 1997, 2002). This practice can be especially debilitating for Latina/o youth, as schools and teachers will often determine students' track placements based on both standardized and informal evaluations of English language competency, which often functions as a proxy for intellectual aptitude (Zuniga, Olson, & Winter, 2005), a critiqued yet still utilized practice (Callahan, 2005). Given the advantages and opportunities afforded to students in the higher tracks (e.g., with rigorous and intellectually challenging curricula, including college preparation courses in high school, etc.) versus lower tracks (e.g., basic and less rigorous curricula, etc.), there is very much at stake here for Latina/o youth, especially when their linguistic backgrounds become treated

as deficits that need to be overcome in schools (Delgado-Gaitan, 1992; Foley, 1997; Moll, 1992; Valencia, 1997; Villenas, 2001).

Beyond differences in opportunity, tracking has important implications for fostering youth identities compatible—or *in*compatible—with school success (Carter, 1970; Zuniga, Olson, & Winter, 2005). If students recognize the groups to which they are assigned, they should also recognize how they are positioned in relation to their peers, and the corresponding differences in expectations that accompany such positioning (Arnold, 2010; Hatt, 2011; Martin-Beltrán, 2010; Relaño Pastor, 2011; Vågan, 2011). Such recognition can become internalized, resulting in the embodiment of identities that align with the expectations—greater or lesser—of meaningful others in school (e.g., administrators, peers, teachers, etc.), which may also endure beyond one's time spent in formal education (Carlone & Johnson, 2007; Haury & Milbourne, 1999).

It remains true that one's placement in any given group does not strictly predetermine educational outcomes or perceptions of self. However, if tracking has the propensity to empower some students at the expense of disempowering others, then the implications for the role of tracking insofar as ameliorating underrepresentation in the sciences can start to become clear. In particular, for Latina/o students that have been tracked on the basis of their English language proficiency, we need a better understanding of the ways in which these students are able to locate productive spaces for themselves in

school science, as well as how schools for their part provide affordances and/or constraints to accessing these spaces. In other words, how does the practice of tracking impact Latinas/os' abilities to claim and perform successful school science identities? This dissertation endeavors to thoroughly answer this question.

As with other disciplinary identities (Calabrese Barton & Tan, 2010; Kane, 2012), successful school science identities entail the recognition of oneself, and receiving recognition from meaningful others (e.g., peers, school authority figures, teachers, etc.), as a competent and/or successful science student (Carlone & Johnson, 2007). These perceptions are influenced, in part, by what counts as "success" in the classroom (Carlone et al., 2011), as well as enduring and powerful cultural-historical models of who competent and/or successful science students are *supposed* to be (e.g., stereotypically: hyper-articulate "geeky" White males) (Calabrese Barton & Tan, 2010). While students may never aspire to these specific cultural models, they may refer to such models—even subconsciously—in ways that can encourage or constrain the understanding of *themselves* as competent and/or successful science students (Atwater, Lance, Woodard, & Johnson, 2013; Foley, 1991; Wortham, 2008).

(1.1.1.) Central Research Questions

This dissertation, and the data that serve as its foundation, has been motivated primarily in an effort to answer the following central research questions:

In what ways do the division of students into groups (based on academic ability [i.e., English language proficiency] and behavior) impact…

(a) …the number and types of opportunities for Latinas/os to succeed in school science?

(b) …how Latinas/os negotiate the concept of 'success' in school science?

(c) …the ways in which Latinas/os claim and perform successful school science identities?

The data that serve as the basis for the findings presented in this dissertation were collected through a three-phase yearlong ethnographic study of the two fifth grade classrooms at Amblen Elementary School, serving a socioeconomically disadvantaged Latina/o student population in Santa Barbara, California. The school's decision—actually, the decision of the school principal and the teachers of the fifth grade—to divide these students (N=63) into two distinct groups was based on their individual achievement scores from a standardized English-Language Arts (ELA) examination taken during the fourth grade.

More precisely, the school principal and the teachers of the fifth grade's decision to divide the students in the way they did was founded on their preconceived notions that English language proficiency serves as a representative indicator of an individual's competence as well as the assumption that dividing students into two distinct groups based on displays of such competence is what is best not only for the students but for the teachers as well. The school was able to operationalize this decision, and justify it, by using standardized test scores as an objective metric by which to do so. Out of the 63 students entering the fifth grade, the students with the 33 highest test scores were placed in one classroom, which the principal and the two fifth-grade teachers refer to as the "high-functioning" group, while the students with the 30 lowest test scores were placed in the "low-functioning" group.

Several additional adjustments, based on behavioral compatibility, were made to the course rosters just before the school year began. In other words, the teachers of the fourth grade met with the teachers of the fifth grade to provide their recommendations for which students work well (i.e., are least disruptive) together, and which do not. On the basis of this information, several students were reassigned to different classrooms prior to the beginning of the school year (e.g., moving one student from the "high" group to the "low" group and vice versa), to intentionally decouple students that seem to exhibit "behavioral problems" (e.g., interrupting lesson plans, talking

too much with friends during classroom instruction, etc.) in an effort to facilitate the ease of classroom management and teaching duties. There will be much more information provided about each classroom and the justification of their composition in Chapter Three (Research Design and Methods) as well as in Chapter Four (Central Findings).

The fifth grade (ages ~10-11) is not only an important year in these students' educational trajectories, but it also marks an especially crucial moment in youth psychosocial development and understandings of self. Between the ages of about six to 13, children are regularly engaged in developing a sense of identity and personal worth, especially in striving to feel competent and productive (Myers, 2007). And as for elementary school science in particular, several longitudinal studies have found that youth's experiences up to the age of 14 are the most crucial set of experiences regarding a student's decision to pursue the study of science later on (Archer, DeWitt, Osborne, Dillon, Willis, & Wong, 2010, 2010; Calabrese Barton, Kang, Tan, O'Neill, Bautista-Guerra, & Brecklin, 2013).

For the reasons cited above, engaging with fifth grade youth—as they navigate the contours of their school science experiences—presents an important window into the moments in which young people begin to conceive of potential futures with/in science while understanding themselves in relation to those around them. Youth accomplish this dynamic process by engaging in a continual negotiation of attempting to "fit in" while simultaneously

internalizing and presenting their unique understanding/s of self to the social world around them.

In California, the fifth grade is also an important year in students' educational trajectories, as students are subjected to the California Standards Test (CST) in science for the first time (CDE, 2011). Because of this, a significant amount of effort, resources, and time is expended in preparation for this examination, the results of which further enroll youth in the high-stakes competition for everything from class placement to school funding, ranking, and reputation in the years to come. As part of the "high-stakes" testing regimes that engulf public schools of all locations, sizes, and student populations (Sloan, 2007), Amblen Elementary School serves as a timely case study, one when it is possible to investigate the consequences of a school "in transition" (i.e., transitioning from one set of standardized testing instruments—the California Standards Test (CST) geared toward the memorization of facts and information necessary to achieve well on multiple-choice examinations—to that of the education industry's new model, the "Common Core").

The Common Core represents the United States' push to encourage every state to adopt a set of national standards in mathematics and English Language Arts (ELA) that moves away from testing regimes that privilege memorization and instead privileges the "application of knowledge through higher-order thinking skills" (CCSSI, 2014). California adopted the Common

Core in August 2010 is currently one of 46 states to choose to do so. From 2013-2017 California has been, and will be, administering incremental implementation of the Common Core, ultimately replacing the CST. During the 2013-2014 school year, the students of Amblen participated in the CST as well as the Common Core assessments. The pressures put on and experienced by students, teachers, and school administrators to achieve high test scores are significant to say the least.

In one sense, a broader sense, this dissertation is about public education in America and the institutional factors that engender and reproduce structural inequality. In this broader sense, it concerns the ways that "deficit" discourse (i.e., the belief that certain students—typically low-income and minority youth—must overcome behavioral, cognitive, cultural, and/or linguistic "deficits" if they are to achieve at a high level academically) influences education at every dimension: from policy, to the organization of schools and classrooms, and even to the pedagogical stances taken up by educators. In a more focused sense, a local sense, this dissertation investigates the impacts that tracking—as a practice that follows from deficit discourse logic—has on Latina/o youth and how they shape their perceptions of self as well as opportunities to succeed in school. In the chapters that follow, I attempt to capture the lived experiences of Latina/o youth as they move through the fifth grade, including: how they formulate and reformulate epistemological stances toward science—including ideas about what it is,

what it is used for, why it is important or not, and in what capacity they envision science factoring into their future job(s) and/or lives—; how they navigate the expectations peers and teachers in their classrooms; how they negotiate achieving academic success while working to maintain specific relationships within their school peer group; and, how they actively *learn* what it means to be a "smart" person and how and when to present themselves as such.

1.2. The Political Economy of Science Education

From the vantage point of the state—given the enormous amounts of capital, energy, resources, and time channeled into financing and regulating education—it remains safe to assume that education is crucial for individual as well as social welfare (Gradstein, Justman, & Meier, 2004). One's successful movement through the levels of elementary, middle, and high school (i.e., K-12 education) is continually marked by participation in standards-based evaluation schemes—internationally recognized as the indicators of successful learning outcomes—that render the display of content knowledge as highly-valued institutionalized commodities, which depending on one's access to, can significantly impact one's life opportunities, positioning, and social status (Claussen & Osborne, 2013; Martin & Siry, 2011).

Within education, science education is of particular importance as mainstream perceptions of science—indeed, how it is transmitted to students in schools—depict scientific practice as an apolitical objective exercise in seeking *truth* and knowledge production, divorced from the messy realities of politics and the global market economy (Richard & Bader, 2010; Sismondo, 2004; Weinstein, 2008). Such understandings take science out of context, rendering invisible the power asymmetries entrenched in the politics of knowledge production, consumption, and circulation (Bäckstrand, 2003), which can be interpreted as a form of "symbolic violence" in that they perpetuate the very same power asymmetries (Bourdieu & Passerson, 1977; Claussen & Osborne, 2013).

Science education in the United States is presently linked to neoliberal economic development strategies, promoted as a banner of progress, and recognized as an achievement of citizenship (Carter, 2005, 2008a; Bencze & Carter, 2011). Since the early 1950s, science education has been promoted in the United States, more so than any other school subject, for its contributions to national security and economic prosperity (Bianchini, 2013; NRC, 2011, 2012; Tan & Calabrese Barton, 2008b). Indeed, science education reform reflects the changing circumstances of the nation's sociopolitical landscape, ever-striving to bolster the nation's reputation and economic security within a globally competitive marketplace (Tate, 2001). While the neoliberal character of science and science education is not one

and the same as the notion of science serving the national interest/s, they are nevertheless importantly comingled.

Recognizing the persistent and pervasive underrepresentation of women and ethnic and racial minority groups, reform efforts of the late 1980s explicitly advocated the necessity of “Science for All” (AAAS, 1989; Tan & Calabrese Barton, 2008b). “Science for All” still remains an unmet goal in the United States, especially for English Language Learners (ELLs), youth from low-income households, and underrepresented minority youth (NRC, 2012). While this equity-minded approach has indeed been welcomed by many, it also has been criticized on the grounds that the ethical problem of educational inequality, in and of itself, does not serve as the *primary* motivation for “Science for All”, rather, it is the familiar rhetoric of science education’s potential to contribute to the nation’s economic security and technological needs that continues to bolster its momentum (Tate, 2001). While it may appear that there exists a contradiction between two different institutional logics at work here (i.e., science for citizenship versus science for profit), they are indeed contemporaneous: to have acquired a form of institutional capital such as is embodied within science education is as much a form of citizenship as it is to commodify this form of capital, using it to leverage a position for oneself whereby they can sell their labor for a wage or salary in which they can later reinvest these payments in the purchase of institutional capital for their children, and so on and so forth. In this way, using

science to participate in the market economy is to be a dutiful citizen. What is more, from the perspective of the state, “Science for All”—or, the fact that underrepresentation still exists in science—is a reminder of the failure to take full advantage of the human capital that would help spur economic growth and fortify our defense, security, and technology sectors.

Problematically, mainstream education policy is still primarily oriented toward remedying underrepresentation by closing the achievement gap (Lee & Luykx, 2006). While it could be somewhat easy to laud this endeavor as a step toward equality, the standardized testing instruments employed to evaluate students have historically benefitted dominant groups with access to capital and resources, and have excluded women and ethnic and racial minority groups, especially Latinas/os (Collins, 2009; Karabel, 2005; Valencia, 2002). In this way, these standardized evaluation schemes play a role in *creating and maintaining* the achievement gap, because they homogenize the interpretation of learning outcomes and perpetuate the myth of schools as spaces of equal opportunity. As comparative measures, standardized assessments reward unfair competition that ultimately reproduces inequalities. In an educational climate where individuals, teachers, schools, school districts, states, and even the nation as a whole, are incentivized and pressured to produce superior test scores, *the* mission of education becomes one of precisely how to attain such scores, often at the expense of all other learning outcomes (Tate, 2001). Despite the “Science for All” discourse and

corresponding curricular reform, inequalities in education persist and seem to mirror broader social inequalities (e.g., residential segregation, etc.), which the underrepresentation of Latinas/os suggests (Alemán, Jr & Alemán, 2010; Castagno, 2008).

1.3. Structure, Agency, and Discourse

Since the 1960s, and borne of concerns with equity, serious consideration has been given to social reproduction in education, especially in magnifying cultural, economic, and linguistic inequalities (Bourdieu & Passerson, 1977; Collins, 2009; Foley, 1991; Willis, 1977). The results of this work continue to challenge preconceived notions of schools as meritocratic institutions of equal opportunity, and instead, reframe them as spaces where social inequalities are maintained and reproduced (Karabel, 2005; Rothstein, 2004). Importantly, these arguments help to shift the epicenter of deficiency away from individuals—and their cultural and linguistic backgrounds—instead placing it within the structure of schools themselves, which can further reinforce minority students' relegation to socioeconomically disadvantaged positions, despite schools' tacit and explicit promises of upward mobility (Villenas & Foley, 2002).

While this work on reproduction in the classrooms contributes much to the ongoing debate of how social inequality is maintained, it is also limited in its explanatory and exploratory potential (Collins, 2009). By only privileging

social structure and constructs such as class, this work loses sight of important variables such as gender and race (Villenas & Foley, 2002). Even more, such positions imply a sort of structural determinism, leaving much less room for agency and individual voice (Suárez-Orozco, 1987). While the role of structure in the reproduction of educational inequality is undeniable, fuller and more robust accounts necessitate the theoretical scrutiny of individuals' actions and agency (Shanahan, 2009).

I understand one's agency to refer to an individual's "Socioculturally mediated capacity to act" (Ahearn, 2001, p. 112), because, *all* action operates within, or at least in reference to, cultural and social structures. It is indeed fruitful to conceive of agency in this way (i.e., by rooting agency in individuals), because of the competitive nature of our educational system, where individuals are forced to compete for access to a variety of resources such as good grades, admission into good schools, and ultimately, the acquisition of good jobs. Correspondingly, I conceive of social structure as the patterns that guide and shape actions via social norms, roles, rules, and other pressures experienced by individuals (Côté & Levine, 2002; Shanahan & Nieswandt, 2011). Any social group (e.g., family, peer group, etc.) or space (e.g., classroom) may have its own social structure/s, aspects of which may be overlapping, competing, or complementary (Shanahan & Nieswandt, 2011). Social structure is produced and reproduced through the interactions between individuals, and *to* individuals, social structure is experienced

through the expectations and reactions of others, which in turn guide and shape individuals' behavior and actions (Burke & Stets, 2009; Stryker, 2002).

One of my central theoretical commitments has been to develop a better understanding of the relationship between agency, social structure, and identity within the context of tracking in elementary school science. Are individuals' actions limited by—or even determined by—the larger social webs in which they operate? The agency-structure dialectic functions in such a way that individuals' actions are bounded by the broader social structures in which they are located, while at the very same time, individuals' actions further reinforce these social structures (i.e., by locating themselves within these larger webs of action and meaning), thus contributing to a recursive loop (Bourdieu, 1990; Rouse, 2006). This dialectical theoretical orientation poses a problem, namely, that individuals' actions contribute to social reproduction, but not to social transformation (Ahearn, 2001; Ochs & Capps, 1996; Sewell Jr., 1992). Since social change *does* occur, what accounts for it? What role do individuals play in this transformative process? In other words, if social structure may be thought of as an interconnected series of mutually reinforcing expectations, norms, and rules; how do individuals help to change the rules of the game? This dissertation contributes to this anthropological debate by employing identity as an analytical lens. Identities live at the boundaries, or intersections, between agency and structure: while identities are individually authored through one's agency, individuals always

understand themselves, while they are understood by others, within particular social spaces, thereby influencing both one's perceptions and presentations of self (Burke & Stets, 2009; Cerulo, 1997). To fully understand this dynamic at work, I also engage the work on "discourse".

According to Kay Milton (2002), there exist two different meanings of discourse: one, as "A particular mode of communication; a field characterized by its own linguistic conventions, which both draws on and generates a distinctive way of understanding the world" (p. 167) (e.g., scientific discourse, religious discourse, etc.); and two, as an area of communication defined by its subject matter (e.g., educational discourse is communication about education). I draw from both conceptions of discourse in this dissertation.

Specifically, with regard to discourse as a mode of communication, formal and informal sites of education operate as spaces where varying discourses intersect and compete, and this has special implications for understanding agency and identity. Students use discourse (tacitly or implicitly) as a means to communicate their identity to others. The choice of how, when, and under what conditions they choose to do so is where agency is located. Thus, in educational spaces where discourses intersect and compete, how and when they are taken up by individuals in particular contexts offers a window into understanding identity as it is being presented, while at the same time, the creative arena in which these discourses play out serves to transform and shape identity in the process. Simply, identity

shapes, and is shaped by, discourse. As Bryan A. Brown (2004) notes, "As we develop an understanding (tacit or implicit) of how discourses enable individuals to become certain kinds of people, individual agency provides us with the power to select discourses to communicate our political, ethnic, and cultural identity" (p. 813). Larger structural forces operating within educational spaces offer a menu of discourses (never pre-determined, but constitutive of local context) from which to take up, and therefore, agency is found within how and when individuals strategically and creatively use and transform them.

1.4. Cultural Perspectives on Identity, Learning, and Voice

Identities are both fluid and multiple and refer to one's understanding/s of self (Cerulo, 1997). They are emergent representations of self—and while potentially enduring, or not—they are individually authored by one's agency, yet shaped by context (Ahearn, 2001; Arnold, 2010; Holland, Lachicotte, Skinner, & Cain, 1998). Identities cannot be conceived outside of the cultural and social relations that continually shape them (Bourdieu 1993, 1994; Brickhouse & Potter 2001). In this way, they are not solely the attributes or creations of individuals, rather, they are *co*-constructed: individuals make sense of themselves, while they are made sense of by others—and then present these understandings of self—differently within particular social spaces (Kane, 2012). Schools and classrooms are important social spaces

for understanding processes of youth identity development, especially disciplinary identities (e.g., see Archer et al., 2010; Arnold, 2010; Brickhouse & Potter, 2001; Brown, 2004; Calabrese Barton et al., 2013; Johnson, Brown, Carlone, & Cuevas, 2011; Shanahan, 2009; Zimmerman, 2012).

Following sociocultural perspectives on education, processes of identity development and learning are mutually constitutive; neither one can be fully understood in isolation from the other (Lave & Wenger, 1991; Shanahan & Nieswandt, 2011; Vågan, 2011). As with identity, learning does not only *occur within* social spaces, but is continually *shaped by* them (Lave & Wenger, 1991). Thus, learning is not only an individual act of knowledge *acquisition*; rather, learning is an active process of *becoming*…that is, becoming a legitimate participant within a particular "community of practice" (Lave & Wenger, 1991). Expectations of, and from, individuals within communities of practice are created and understood through communal interactions (Lave & Wenger, 1991; Shanahan & Nieswandt, 2011).

While Lave and Wenger's "communities of practice" model certainly has been influential in science education scholarship (e.g., see [Calabrese Barton & Tan, 2010; Shanahan, 2009; Tan & Calabrese Barton, 2008b])—helping to make sense of how various communities with different goals, norms, structures, and values guide and shape individuals' perceptions and presentations of self—this framework lacks the capacity to account for the power relations that cuts across it (Cox, 2005).

Holland et al. (1998) “figured worlds” can push the “communities of practice” model further by accounting for power relations that constrain and facilitate participation within communities (Vågan, 2011). Figured worlds are “Socially and culturally constructed realm[s] of interpretation in which particular characters and actors are recognized, significance is assigned to certain acts, and particular outcomes are valued over others…[figured] worlds are sociohistoric, contrived interpretations or imaginations that mediate behavior” (Holland et al., 1998, p. 52). School science, for example, may be thought of as a figured world, and when conceptualized as such, it can serve as a framework for understanding the structure or social space that shapes individual agency, identity performances, and participation in classroom and school activities (Hatt, 2011; Tan & Calabrese Barton, 2008a, 2008b). If we understand learning as a process of becoming, then in what ways are students within low track placements learning to *become* less competent—to present themselves as *less smart* perhaps—than their peers within high track placements?

Pervasive social categories such as class, ethnicity, gender, race, and perhaps most crucially for Latinas/os in school, one’s command and display of English language proficiency, retain meanings that can cut across figured worlds and serve as [stereotyped] markers of ability, which can then position individuals unequally in relation to one another, in terms of access—or lack thereof—to opportunities to participate meaningfully and/or succeed

(Fordham, 1993; Lei, 2003). While individuals may intentionally employ their agency to affiliate or disaffiliate with groups of other individuals representing these pervasive social categories at times when it is convenient for them to do so as a means of identity performance, these individuals are also subjected (by others) to the very same social classification schemes in ways that serve to disenfranchise them.

Schools are not only spaces of social reproduction, they are also spaces of epistemological reproduction, and these two processes mutually inform one another (Baszile, 2008; Carter, 2010): as one comes to understand what science is (for example), how it is used, and for which purposes, one also develops an understanding of self in light of this new knowledge, and in relation to the communities that practice, teach, and use it (Lave & Wenger, 1991; Vågan, 2011). These particular cultural, social, and political relations are embedded in the mediums (e.g., activities, assignments, experiments, textbooks, etc.) that transmit content knowledge in schools (Haraway, 1988; Star, 1991; Traweek, 1988; Van Eijck & Roth, 2011; Weinstein, 1997, 2008). Through students' interactions with ideas, other students, teachers, textbooks, and the like, students not only acquire content knowledge, but more importantly, understandings of how to position oneself, and others, within the much broader sociocultural webs that intersect throughout one's educational experiences (Kane, 2012; Moje, Collazo, Carrillo, & Marx, 2001; Varelas et al., 2011).

Succeeding in school science has been portrayed by some as “cultural border crossing” (Aikenhead, 1996, 1997, 2001), referring to the process of successfully crossing from the ethno- and sociolinguistic practices tied to one’s cultural and ethnic/racial identity, into the culture of school science (e.g., its discourses, norms, practices, ways of knowing and speaking, etc.). Educational anthropologists and science education scholars have documented Latina/o youth’s discomfort and/or disinterest in crossing these borders, particularly when school science idealizes and privileges the cultural backgrounds and sociolinguistic practices of the English-speaking White middle-class (e.g., see Chapa & De La Rosa, 2006; Riegle-Crumb, Moore, & Ramos-Wada, 2011; Rochin & Mello, 2007; Valencia, 2002; Zuniga, Olson, & Winter, 2005). Under these circumstances, minority youth may feel the need to “Masquerade as the authentic, idealized ‘Other’” (Fordham, 1993, p. 26) to achieve positive recognition and success in school. In this way, when minority youth actively or passively resist this “idealized ‘Other’” (e.g., the middle-class English-speaking White male), this act of resistance may also be symbolic of part of an even broader resistance, that is, resistance of the system that serves to reproduce White male dominance and privilege.

Students negotiate membership within school and classroom communities, with varying degrees of success, by claiming and performing identities of who they understand themselves to be—and who they want to be—within these spaces (Calabrese Barton et al., 2013; Delgado-Gaitan,

1992; Wortham, 2008). However, students are not free to be whomever they wish; their ability to author identities is facilitated by the patterns of expectations, meanings, and values of the figured worlds they traverse (Carlone, Haun-Frank, & Webb, 2011; Kane 2012; Varelas et al., 2011). Within figured worlds, individuals' actions and interactions simultaneously reproduce the normative practices of the social space/s they traverse (Burke & Stets, 2009; Stryker, 2002), while varying levels of "cultural capital" (Bourdieu, 1993) become assigned to particular practices and outcomes, which can in turn position individuals hierarchically within the figured world (Holland et al., 1998).

In schools, *intelligence* may be thought of as a form of cultural capital (Gresalfi, Martin, Hand, & Greeno, 2009); it is socioculturally constructed—not the static attribute of an individual—and one's ability to take up a successful school science identity, and how this identity gets hierarchically positioned relative to others', may rely on interpretations of one's intelligence (Hatt, 2011). For Latinas/os, indicators of intelligence often hinge on their performed English-language competency (Lareau & Weininger, 2003; Monzó & Rueda, 2009). In this way, "One cannot pull off being a particular kind of person (enacting a particular identity) unless one makes visible to (*performs* for) others one's *competence* in relevant practices, and, in response, others *recognize* one's performance as credible" (Carlone and Johnson, 2007, p. 1190). Understanding how Latinas/os are able to claim and perform

successful school science identities necessitates mapping the contours of the figured world of school science, including how students position themselves, and get positioned, within it.

1.5. Latinas/os in (Science) Education

Critical race scholars in education often claim that public schools in the United States operate under the assumption that educational implementation and evaluation—and the theories used to support them—are neutral and universal; that they do not put some students at a distinct advantage while putting others at a distinct *dis*advantage (Paris, 2012; Siegel, 2006). One example of this lies in pedagogical techniques employed by primary and secondary school teachers, ones that most often resemble the sociolinguistic and parenting practices of the English-speaking White middle class (Reyes, 1992, 2001; Váldes, 1996). Latina/o educational scholars have been critical of the un-reflexive stance that many schools and teachers adopt, namely, the ethnocentric presupposition of the White middle class model of family function, home structure, and parent-child relationship as normative and standard (Moreno & Valencia, 2002; Villenas & Foley, 2002). These practices have been shown to disadvantage Latinas/os by limiting their access to opportunities and resources necessary to excel in school (Callahan, 2005). Of the many research agendas concerning Latina/o educational inequality, few are as crucial, and as timely, as making sense of Latina/o successes and

failures in science, a subject that has consistently been the focus national and international attention for decades. The role of “tracking” is critical here.

Tracking has been implemented in public schools for decades as “The permanent assignment of children to classrooms or sections (tracks) composed of individuals assumed to have similar abilities, interests, or other characteristics [including behavioral propensities]. Tracking involves formal institutional decisions, planning and curriculum organization” (Carter, 1970, p. 87). Lower tracks are generally provided with basic, less rigorous curricula, while students in higher tracks benefit by gaining exposure to high-quality and rigorous instruction, and in high school, access to college preparation courses (Haury & Milbourne, 1999; Oakes, 2005; Valencia, Menchacha, & Donato, 2002; Zuniga et al., 2005). Proponents of tracking argue that it increases educational efficiency and that every student benefits as a result (Oakes, 2005; Valencia et al., 2002).

For Latinas/os, tracking only seems to provide barriers to long-term academic success (e.g., college admission, etc.), especially in science, as Zuniga et al. (2005) found that schools often make decisions about science track placements based on students’ command of the English language. Indeed, Latinas/os’ level of English proficiency is also widely used to make track placements for *all* school subjects, not just science, and this is especially true of tracked primary school classrooms, where one teacher is responsible for teaching students all of the core subjects (e.g., English,

history, math, science, etc.). Tracking students on the basis of their command of the English language is founded on the assumption that most subjects are "vocabulary intensive" (Zuniga et al., 2005). Problematically, given the privileged status of English in schools, it is unsurprising that English Language Learning (ELL) Latina/o students are often placed in lower tracks.

Science education scholars invested in educational equality maintain that the tracking of Latina/o students is neither an unrelated precursor to, nor a viable solution for, the achievement gap but rather part of its *cause* (Peng, Wright, & Hill, 1995). If Latinas/os are *under*represented in the higher "gifted" tracks, it is because they are *over*represented in the lower "special needs" tracks; a trend that has been decades in the making (Carter, 1970; Peng et al., 1995; Valencia, 2002; Zuniga et al., 2005). In many ways, the placement of Latinas/os in low track science classes can be a self-fulfilling prophecy: when it has been suggested to students, by their placement in lower tracks, that they are neither as capable nor as smart as the students in the higher tracks, it should not be surprising that their test scores remain low; they are not *expected* to succeed in the same ways as the students of the higher tracks.

Latina/o movement through the education system of the United States might be more accurately thought of as a "pipette"—rather than the often-used "pipeline" metaphor—or at least, a pipeline with massive and systemic leaks (Chapa & De La Rosa, 2006). At 15.1%, Latinas/os have the highest

high school dropout rates of any minority group (NCES, 2012). Such problematic trends are not just *educational* problems, they directly contribute to systemic socioeconomic inequalities faced by many minorities and other marginalized groups and are therefore fundamentally *democratic* problems. Inequalities accumulate when the playing field is not level, and as long as it remains so, the distance between the advantaged and the disadvantaged will only widen (Merton, 1988).

In the United States in 2012, the median annual income for a full-time and year-round wage or salaried worker between the ages of 25 to 34 is $22,900 for those *without* a high school credential; $30,000 for those with a high school credential, and $46,900 for those with a bachelor's degree (NCES, 2012). Sufficient acquisition of credible knowledge, both in amount and kind, is embodied and symbolized through degree attainment, thereafter functioning as a form of institutionalized cultural capital (Claussen & Osborne, 2013) unlocking doors to even greater opportunities and prestigious forms of capital both financial and social.

While tracking does not strictly prohibit any student from succeeding or attaining a high-school diploma or a bachelor's degree, it also does not facilitate this process for those placed in the lower tracks. If anything, it makes their journey to the top much more obstructed and arduous. Longitudinal studies of students placed in lower tracks note their significantly lower levels of high school graduation when compared to their counterparts placed in the

gifted or higher tracks (Oakes, 2005). Because of such disturbing trends, many Latina/o educational scholars have begun to think of tracking as form of neo-segregation, or, "resegregation" (Valencia et al., 2002). Since *Brown v. Board of Education* (1954), what is at stake in education is no longer the right to a shared "physical space", but to a truly *equal opportunity* to learn the same highly valued knowledge (Tate, 2001). Put another way, the underrepresentation of Latinas/os in science is not an "achievement gap" problem; it is an "inequality of opportunity" problem.

In classrooms all across the nation, while it remains true that Latina/o students disproportionally take up space in the lower tracked courses and not in the higher ones, this study does not examine inequality in tracking assignments made along ethnic/racial lines (as 100% of the students that participated in this research identify as Latina/o), rather, it investigates the consequences of what happens when Latina/o students are tracked according to symbolic markers of their ethnic/racial identity, that is, their varying levels of English language competency. As such, my central research questions were formulated as follows:

In what ways do the division of students into groups (based on academic ability (i.e., English language proficiency) and behavior) impact…

(a) …the number and types of opportunities for Latinas/os to succeed in school science?

(b) …how Latinas/os negotiate the concept of 'success' in school science?

(c) …the ways in which Latinas/os claim and perform successful school science identities?

1.6. Research Site

(1.6.1.) Santa Barbara County (SBC) and the City of Santa Barbara

Figure 1.1. Map of California's 58 Counties. Santa Barbara County is located within the southern Central Coast of California, with San Luis Obispo County to the north and Ventura County to the south.
(Source: California State Association of Counties, 2014).

Santa Barbara, California boasts some of the most beautiful landscapes and vistas the continental United States has to offer. On an average 70-something sunny afternoon, with low humidity—indicative of the region's Mediterranean climate—strolling along the many miles of coastline, and with eyes fixed upon the confluence of the rolling Santa Ynez Mountains and the mighty Pacific Ocean (which Santa Barbara is comfortably situated in between), one need no longer wonder why this small city in the southern tip of California's Central Coast is colloquially referred to as the "American Riviera". And yet, this is but *one* side of Santa Barbara; the side where well-off tourists enjoy leisurely strolls down State Street (the several-mile main artery running north to south through the city, terminating at Stearns Wharf where it greets the Pacific Ocean) to dine or shop in pricey establishments that have all been designed to conform to the city's architectural ordinance, Spanish Colonial Revival architecture. This is the tourists' Santa Barbara, the popularized and stereotyped vision in postcards; this is *visible* Santa Barbara. There is another side to this town; a side mostly tucked away and hidden from plain sight; this is *invisible* Santa Barbara, that is, invisible to tourists and to collective public perception for all those living outside the city. The *visible* side is simply the image of Santa Barbara that Santa Barbara wishes to put forward.

While Santa Barbara County (SBC)—with a total population of 435,697 (USCB, 2014)—is generally regarded as affluent, with a median household income of $60,078, 18th highest out of California's 58 counties, the area still

suffers from environmental problems including air and water pollution and water shortages as well as social problems such as diabetes, food insecurity, malnutrition, obesity, and unjust working conditions for agricultural workers (Cleveland, 2014). As this section will go on to explore, the racialized inequality that persists throughout SBC—which manifests in residential segregation, access to competitive high-paying jobs, and communities' health and nutritional statuses—in turn impacts the demographic composition of the SBC school districts, ultimately resulting in unequal access to high quality education.

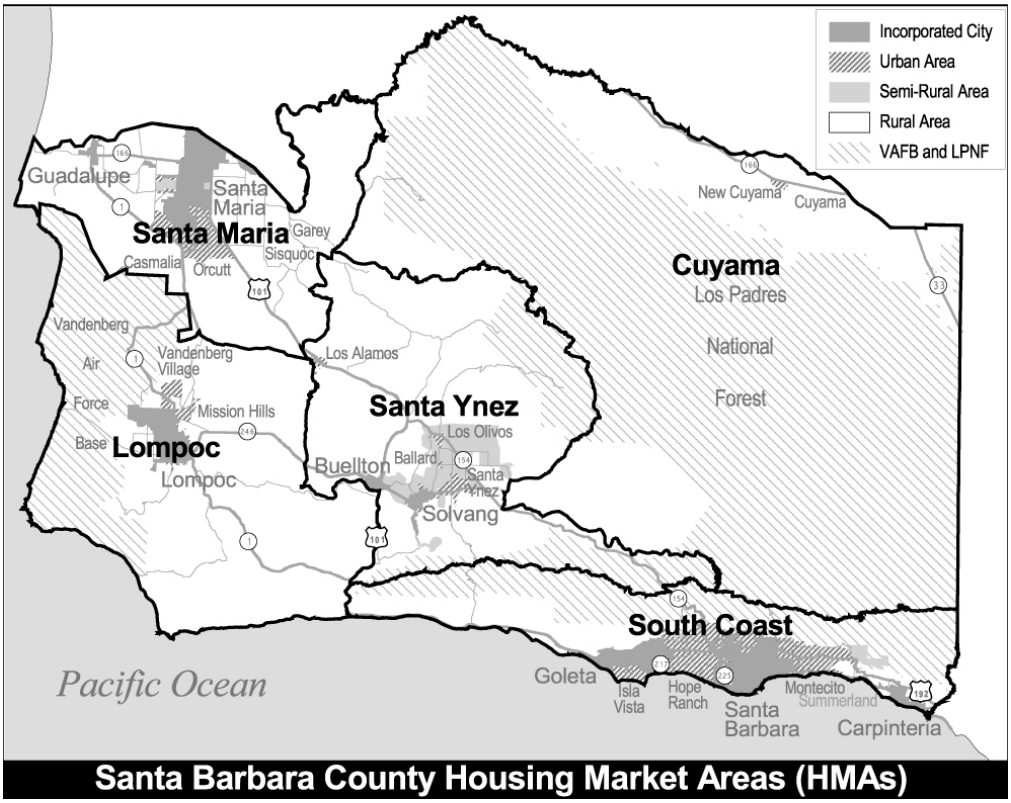

Figure 1.2. Map of Santa Barbara County Housing Market Areas (HMAs). (Source: County of Santa Barbara, 2015).

A group called the Insight Center for Community Economic Development (ICCED), a reputable national research organization committed to promoting economic health in marginalized communities, recently published a report titled *A Snapshot of Poverty in Santa Barbara County* (2013), which distills and synthesizes the most recent US Census data regarding the most important indicators of poverty in this region. This report uses the most recent and credible guidelines to establish poverty-defining thresholds; for example, the federal threshold for a household and/or family of four comes to $23,850, any sum below which constitutes those living in the household to bear an *impoverished* designation (USDHHS, 2014). In total, 18% of SBC's residents currently live below the federal poverty line (ICCED, 2013).

The recent economic recession of 2006-2010 was especially devastating for the people of SBC, resulting in a 52% increase in residents living below the federal poverty level, as well as a 61% increase in child poverty, by far the most impoverished age group in the county (ICCED, 2013). State budget cuts have had deleterious effects on SBC, which have prompted further reductions in spending for infrastructure and human services programs assigned to provide resources to vulnerable communities. These communities, which are predominantly Latina/o, have been disproportionately impacted by the changes, engendering even more pronounced levels of poverty and hardships in securing resources needed for happy and healthy

lives. Marginalized socially and economically, these families account for a substantial segment of Santa Barbara's invisible fabric.

Referring to the Santa Barbara County Housing Market Areas (HMAs) map above in Figure 1.2., the region is divided into three sub-counties: North County (comprised of the Cuyama and Santa Maria HMAs); Mid County (comprised of the Lompoc and Santa Ynez HMAs); and, South County (comprised of the South Coast HMA). SBC is marked by inequalities, and a few general patterns emerge when looking at the demographic distribution among the sub-counties.

Whites and Latinas/os comprise the two largest ethnic/racial groups in SBC. While 48% of the SBC resident population is White, recent figures put the Latina/o population in SBC at 44.1%, higher than in the state of California (38.4%), and considerably higher than in the United States overall (17.1%) (USCB, 2014). Looking more closely, however, Latinas/os are more heavily concentrated in North County at 61% of the resident population, whereas only 31% of the North County resident population is White (ICCED, 2013). The figures are almost completely reversed when looking at the demographics of South County: 58% White, 32% Latina/o (ICCED, 2013).

Tourism, agriculture, and construction rank among the county's top three economic activities and sectors of employment (County of Santa Barbara, 2013), however these activities are spatially segregated, with tourism occurring primarily in the South County (where tourists regularly flock

to the *visible* side of the city of Santa Barbara as well as the exclusive and wealthy city of Montecito adjacent to it), while agriculture is heavily concentrated in the working class Mid County and North County where greater proportions of population are Latina/o.

Agriculture is the county's single greatest economic boon, exceeding one billion dollars in gross production value in 2007, with strawberries ($313.5 million), broccoli ($131.1 million), and wine grapes ($99.9 million) accounting for its most lucrative exports (County of Santa Barbara, 2013). Despite this production, agricultural workers' average annual salaries are the lowest in the county at $22,015 (County of Santa Barbara, 2013). One of the reasons for this disparity is because the vast majority of the county's agricultural labor force has been historically supplied by noncompetitive migrant labor, mostly by immigrants from Central America and Mexico (Cleveland, Radka, Müller, Watson, Rekstein, Wright, & Hollingshead, 2011). The majority of the county's unauthorized/undocumented migrant residents (rough estimates put figures at close to 40,000 for SBC, or, about 10% of the county's population), are either unemployed or working seasonally in the agricultural fields of Mid County and North County (CAUSE, 2011).

Gross disparities in median home price for the properties in North County ($257,821) compared with those in South County ($774,929) reflect the income inequalities and that follows racial lines and exacerbates residential segregation (ICCED, 2013).

Although the city of Santa Barbara is located within the generally affluent South County, it contains pockets of pronounced poverty (that is, the *invisible* side), and for this reason, no city felt the negative impacts of the recent economic recession more so than Santa Barbara—with a total population of 88,410 (USCB, 2014)—experiencing close to a 17.5% drop in wages during this time, from a city average of $19.69 per hour in 2000 to $16.26 in 2011, coming to an annual average wage difference of $7,134.40 (ICCED, 2013). Such declines disproportionately impact those living in poverty, with decreases in annual wage earnings representing a forfeiture of one-third (or more) of the total household income for a family of four.

The city of Santa Barbara is one of four cities in the county identified as a "High Poverty Area" (HPA), which according to the ICCED (2013) is a "cluster of census tracts adjacent to one another where 20 percent or more of individuals are living below 100 percent of the Federal Poverty Thresholds" (p. 45). SBC's median household income ($60,078) is extremely similar to the state of California as a whole ($60,883), ranking 18th out of the state's 58 counties, yet the city of Santa Barbara is home to the highest levels of income inequality, where the median household income of the highest income census track ($128,775) more than quadruples that of the lowest income census track ($28,631) (ICCED, 2013). This significant income inequality follows racial lines as well, where Latina/o households earn on average only two-thirds of what White households make ($46,274 compared to $69,286,

respectively) (ICCED, 2013). Unsurprisingly, income inequality is exacerbated by the fact that those living in the HPAs (the majority of whom are Latina/o) are also the very same individuals that tend to work in the lower-paying sectors of the county's economy, including manual agricultural labor as well as low-paying jobs in the tourism accommodations and food services industries (ICCED, 2013).

SBC also recently ranked as California's 47th most (out of 58) food insecure county with nearly 50% of low-income households in SBC classified as "food insecure" (Shimada, 2014). Over 54% of the adults in SBC are considered to be overweight or obese (McCann, 2011). Food insecurity and malnutrition impact the children of SBC as well. In 2010, SBC ranked as having the 27th highest (out of 58) rate of overweight or obese fifth, seventh, and ninth graders at 37% (Cleveland, 2014). Over 45% of low-income children in SBC are considered overweight or obese (McCann, 2011).

In one way or another, all of the above issues are tied to poverty, and the Latinas/os of SBC suffer from disproportionate levels of impoverishment. For example, while 49% of the White adults in SBC are considered overweight or obese, that figure climbs to 73% for Latinas/os (McCann, 2011). The inequality that falls along racial lines is especially egregious given substantial proportion of the county population made up by Latinas/os at 44.1%.

Wedded to the cycles of poverty, and marked by indicators such as income inequality, are levels of educational attainment. Within the county's HPAs, 61.8% percent of its residents have attained a high school diploma or GED, which is 21 percentage points lower than the California state average (ICCED, 2013). Additionally, only one in every six adults in a HPA has completed a BA degree, while one in every three has done so statewide (ICCED, 2013). These figures are significant as there is a very strong relationship between parents' educational attainment and their children's academic success, especially when their children are younger, which in turn shapes opportunities for positive outcomes later on in life, including but not limited to the attainment of college and/or graduate degrees that are strongly correlated to higher earning potential (Palmer, 2009).

Within SBC public schools, Latina/o students are *more* disadvantaged than they are at the state level, while White students are *less* disadvantaged than they are at the state level. SBC contains a total of 20 K-12 school districts (120 schools), with an enrollment total of 67,686 students (CDE, 2014). Within these schools, Latinas/os comprise just over 67% of the total student population, with White students—comprising the only other ethnic/racial group over 2%—at 25.1% (CDE, 2014). These figures compare with statewide totals at 53.3% and 25%, respectively (CDE, 2014). Within SBC public schools, 63.7% of its students are deemed "socioeconomically disadvantaged", comparable to the state average at 60.9% (CDE, 2014). In

SBC, Latinas/os makeup 86.6% of the socioeconomically disadvantaged student population, which is considerably higher than the state average at 70.8% (CDE, 2014). Again, when compared to White students—who account for only 8.4% of the disadvantaged students at the county level and 11.6% at the state level—Latinas/os are disproportionately socioeconomically disadvantaged within SBC (CDE, 2014), mirroring the broader patterns of inequality along racial lines that exists countywide.

(1.6.2.) Santa Barbara Unified and Amblen Elementary

Within the 20 SBC school districts, Santa Barbara Unified School District (SBUSD) is the second largest, with a total enrollment of 15,518 students, or, 22.9% of the county's student population (CDE, 2014). "Unified" school districts are unique to the states of Arizona, California, Kansas, and Oregon, and are school districts that include and oversee both primary schools (e.g., kindergarten through middle school or junior high [K-grades 8/9]) as well as secondary schools (e.g., high schools [grades 9/10 through grade 12]). SBUSD oversees 22 schools in total: 13 elementary schools; four junior high schools; and, five high schools. Almost 60% of the students in SBUSD schools are Latina/o, while just under one-third are White, and the third largest ethnic/racial group is Asian-American at 2.8% (CDE, 2014). About half of SBUSD students are classified as socioeconomically

disadvantaged; yet 77.2% of SBUSD Latina/o students are socioeconomically disadvantaged while only 9.8% of White students are (CDE, 2014).

Table 1.1. SBUSD Graduation and Dropout Rates 2012-2013.

	White:	Black:	Latina/o:
Graduation Rate:	91.50%	91.00%	80.70%
Dropout Rate:	6.10%	6.10%	13.50%

(Source: CDE, 2014).

For the 2012-2013 cohort in SBC (5,143 students), there was an 84.7% graduation rate coupled with a 10.5% dropout rate (CDE, 2014). The SBUSD cohort that same year (1,687 students) fared slightly better with a graduation rate of 89.7% and a dropout rate of 7.1% (CDE, 2014). Latinas/os, however, claimed the county's lowest graduation rate (80.7%) as well as the highest dropout rate (13.5%) of all ethnic/racial groups, with the second-highest dropout rates (6.1%) being shared among both African American and White students, while each group boasted high graduation rates of 91.5% and 91%, respectively (CDE, 2014).

Table 1.2. SBC Enrollment in Postsecondary Universities 2008-2009.

California State Average:	74.40%
*SBC Average:	73.30%
*SBC Latinas/os:	66.00%
*SBC Socioeconomically Disadvantaged:	64.40%
*SBC $^{+}$ELLs:	48.10%

*Santa Barbara County
$^{+}$English-Language Learners
(Source: CDE, 2014).

Provided the most recent data for those that graduated high school in SBC in 2008-2009 (4,291 students), 73.3% went on to attend postsecondary universities, which is comparable to the state average at 74.4% (CDE, 2014). SBC Latinas/os, of all ethnic/racial groups, have the lowest percentage of high school graduates enrolled in postsecondary universities at 66% (CDE, 2014). Within SBC, 64.4% of socioeconomically disadvantaged high school graduates have gone on to enroll in postsecondary universities, while that number drops to 48.1% for those students that graduated with the "English Language Learner" (ELL) label (CDE, 2014).

As discussed earlier, the racialized inequality that persists throughout SBC—which manifests in residential segregation, access to competitive high-paying jobs, and communities' health and nutritional statuses—in turn impacts the demographic composition of the SBC school districts including SBUSD and its 13 elementary schools, as depicted below in Figure 1.3.:

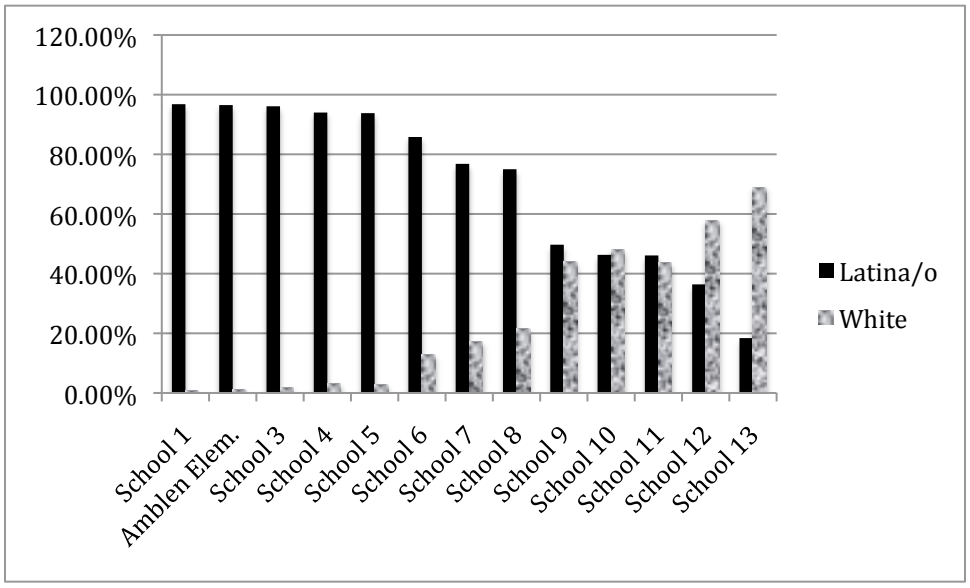

Figure 1.3. Racial Demographics of 13 SBUSD Elementary Schools.
Note: Enrollment percentages provided for the two largest racial groups in SBUSD. (Source: CDE, 2014).

The research undertaken to produce this dissertation was carried out through a three-phase yearlong ethnographic study of two fifth grade classrooms (33 students [18 female and 15 male] in one classroom, and 30 [15 female and 15 male] students in the other) at Amblen Elementary School in Santa Barbara, California, which is among the 13 elementary schools of SBUSD. Amblen, serving 594 students in total (293 female students and 301 male students), is situated within a small residential community on the Eastside of Santa Barbara, part of the *invisible* side of Santa Barbara, where many low-income families—most of whom are Latina/o—reside.

In addition to the 21 full-time regular classroom instructors, Amblen also employs single-subject enrichment educators in the fields of art, music, reading, and science, as well as a school psychologist and a speech

therapist. All of these individuals are classified as “highly qualified teachers”, meaning, they “have at least a bachelor’s degree from an accredited institution of higher education [and] hold the appropriate state certification for each ESEA [Elementary and Secondary Education Act]” (CDE, 2011b).

Services made available to Amblen students and their families include an onsite social worker, three Americorp members, and a Healthy Start advocate as part of the Eastside Obesity Initiative, which provides weekly fitness training in the school gymnasium, and night classes for parents of children with high Body Mass Indices (BMIs), which is a metric used to screen individuals for weight-related health issues (SBUSD, 2013). California Physical Fitness Tests are administered to all students in California public schools in grades five, seven, and nine. At Amblen, just 18.3% of the fifth grade students qualified as “physically fit” individuals during the 2011-2012 school year (SBUSD, 2013).

Amblen implements a standards-based instructional curriculum, administering ongoing assessments and analyses of student work. Amblen recently emerged from a five-year stint on the Federal Intervention Program Improvement (PI) for failing to make Adequate Yearly Progress (AYP) for the overall percentage of students achieving “proficient” status in English-Language Arts (ELA), currently at 50% (CDE, 2014). Despite its attention to individual achievement and science enrichment, 45% of Amblen’s fifth grade students met or exceeded state the Standardized Testing And Reporting

Program (STAR) science standards, well below the Santa Barbara Unified School District (64%) and state (60%) figures for the 2011-2012 school year (SBUSD, 2013).

Reflecting the demographic and socioeconomic characteristics of the surrounding communities in which Amblen is located, 96.5% of the students at Amblen identify as Latina/o—however, *every* student in the fifth grade identifies as Latina/o—and 90.6% of Amblen's students are deemed socioeconomically disadvantaged, 97% of whom are Latina/o (CDE, 2014). All of the fifth grade students were born in the United States, with the exception of one boy who was born in Mexico. The parents of these students are low-income and either first-generation or second-generation Mexican migrants; only one girl's parents are first-generation Guatemalan migrants; two student's parents were both born in the United States; and one girl's mother was born in Mexico while her father was born in the United States. Almost all of the fifth grade students at Amblen are enrolled in the school's free lunch program, a reliable indicator of the students', and their families', relatively impoverished statuses.

As previously mentioned, the fifth grade students were separated into one "high-functioning" group (33 students) and one "low-functioning" group (30 students), on the basis of their demonstrated level of English language proficiency as assessed by their performance on a standardized examination taken during the fourth grade. For the students of the fifth grade, command

and confidence in their use of the English language has important implications for how they experience and navigate school. Eighty-five percent of the students at Amblen are classified as English Language Learners (ELLs) (CDE, 2014).

Throughout the school day, students remain within the group they have been assigned (learning subjects such as math, history, science, and English from one primary teacher), with the exception of several weekly "rotations" in art, music, and science, all held on Mondays. During these weekly one-hour lessons, students receive instruction from an "enrichment specialist" in one of these three respective fields (i.e., art, music, and science). Of these three subjects, science is the only one in which students also receive regular instruction from their primary teachers.

1.7. Broader Significance

This dissertation operates at the confluence of notions about class, gender, language, and race, especially as they revolve around the implementations and interventions of K-12 public education in the United States and the hegemonic meritocratic discourse on which it is founded. This dissertation engages and contributes to scholarship within the following areas: the political economy of education; discourse and the dialectical relationship between agency and structure; cultural perspectives on identity, voice, and learning; and, Latinas/os in science education.

During my time with the fifth-grade youth of Amblen Elementary School, I found that the students placed in the low-functioning track are not necessarily *expected* to succeed in the same ways, and with the same frequency, as the students of the high-functioning group. These expectations manifested in the differences in complexity and rigor in classroom activities and assignments (e.g., practicing how to *pronounce* the scientific vocabulary versus giving classroom presentations about scientific concepts and ideas, respectively, etc.), as well as teachers' praise or lack thereof for completing such activities, thereby reinforcing different sets of expectations between classrooms.

I also found that while there exist considerable overlaps, what it means to be a "good" science student in one classroom is qualitatively different in the other. Students in the low-functioning group—more so than students in the high-functioning group—understand themselves, and others, as good science students based on behavioral ideals (e.g., to be well behaved, to not talk back to teachers or during class, and to be nice and kind to others, etc.) rather than academic ones. There existed greater peer group recognition and social rewards for academic successes in the high-functioning group than in the low-functioning group. All of these outcomes, I argue, are heavily shaped by the different *expectations* placed upon students between the two classrooms.

The different sets of expectations operating in each of the two classrooms shaped not only the academic learning that took place within

them, but the *social* learning as well. The students in the low-functioning group learned *not* to present themselves as *academically* and/or *intellectually* "smart", for doing so could marginalize them within their peer group, as I show later, and instead, these students learned to be "good" students simply by following instructions and by being well behaved. The students of the high-functioning group, on the other hand, were more actively encouraged to present themselves as *academically* and/or *intellectually* "smart". Expectations shape identities. When I asked the students in each classroom if they believed that "one classroom is smarter than the other classroom", almost *every* student agreed that the students in the high-functioning classroom are smarter than the students in the low-functioning classroom.

Something is wrong with our education system. Underrepresentation is not only a symptom, but also a reliable indicator, of the structural inequality that pervades this system. Structural inequalities are more challenging to overcome; they are often shrouded in invisibility and insulated by hegemonic discourse. Perpetuators of the hegemony—unknowingly or not—assert that the answer to this question lies in closing the achievement gap. However, we must question the implicit assumption that if *all* students performed equally well on standardized examinations, that underrepresentation would cease to exist. How we choose to frame this issue now dictates our avenues for its resolution in the future. The time has indeed come to reframe.

Underrepresented minority youth are often perceived as having cultural and/or sociolinguistic deficits that need to be overcome in schools, and this is especially true for Latina/o youth (Delgado-Gaitan, 1992; Foley, 1997; Hogg, 2011; Valencia, 1997). Evidence of this lies in the prevalence and persistence of Latinas/os' low track placements, often made from assessments of their English language proficiency (Zuniga et al., 2005). To achieve truly equitable outcomes in education, it is crucial that we become equally concerned with the conditions that guide and shape *how*, *when*, and *why* diverse groups of students are motivated to achieve and learn in meaningful ways, not simply *what* students learn or the scores they attain. The implications for greater equity are clear: the ways in which students perceive themselves as learners and doers—and how others perceive them in these ways—shape their actions, or inactions, in school thereby impacting learning outcomes, opportunities, and perceptions about accessible, achievable, and appropriate futures.

The problematic educational trends outlined thus far are not just *educational* problems; they directly contribute to systemic socioeconomic inequalities faced by many minorities as well as other marginalized groups and are therefore fundamentally *democratic* problems. When it comes to the division of students, what is at stake here is no longer the right to a shared "physical school space" as it was in *Brown v. Board of Education*, but for the right of every student to have access to a *truly* equal and shared opportunity

to the same high-quality valued knowledge (Tate, 2001). Inequality within the United States education system is not an achievement issue, it is a civil rights issue (Tate, 2001).

Improving our education system through seeking to foster diversity as well as my own personal commitments to equity and social justice—which, to me, means providing *every* student with an equal opportunity to achieve and succeed—are the manifestations of how I define myself as a scholar, a teacher, and a person. Those working to increase diversity and ameliorate underrepresentation must also seek avenues for accomplishing this goal long before students ever set foot on a college campus. If ethnic/racial minorities are not well represented in universities and in the workforce, it is because they are also systematically disadvantaged and disempowered in *every* educational venue preceding these stages, and this includes elementary schools; many of the students with whom I have worked will be fighting for their places in our universities just seven years from now. It remains my hope that they envision college as an accessible and desirable place to be.

1.8. Overview of Chapters

The following is a synopsis of what the reader can expect in the chapters that follow: Chapter Two (Theoretical Background and Framework); Chapter Three (Research Design and Methods); Chapter Four (Central Findings); and, Chapter Five (Conclusions and Implications).

(1.8.1.) Chapter Two (Theoretical Background and Framework)

In this chapter, I offer a synthesis of the broader conceptual frameworks employed throughout this dissertation to interpret my central research findings. I also provide the theoretical context that supported the development of my primary research questions as well as the methodology used to gather the data necessary to answer them. I structure this chapter in such a way to stitch together the theories applied throughout this dissertation at various scales from the macro perspectives (e.g., the role of education from the position of the state) to the micro perspectives (e.g., the ways in which individual students employ agency to craft identities and understandings of self in school).

At the broadest scale, I use a critical political economy approach to articulate the role of the state in financing and regulating K-12 public education, which includes important assumptions, discourse, and ideologies about education in the United States. Here I demonstrate that, despite mainstream understandings of schools as meritocratic institutions of equal opportunity, deficit discourse (i.e., the belief that certain students—typically low-income minority youth—must overcome behavioral, cognitive, cultural, and/or linguistic "deficits" if they are to achieve at a high level academically) influences education in every dimension: from policy, to the organization of schools and classrooms, and even to the pedagogical stances taken up by

educators. From here, I engage critical theories of class, race, and gender, as deficit discourse is maintained and reproduced by underlying assumptions supporting institutional and structural racism and classism.

Specifically, I draw from critical theories of race to offer a more detailed examination of the history of some of the successes and failures of Latina/o students in the American public education system, including some of the unique challenges and obstacles that Latinas/os confront regularly within this system. I proceed to highlight the more important interventions of scholarly response to deficit discourse with a special emphasis on the critical educational ethnographies produced by Latina/o scholars. This scholarship calls for a reexamination of the deficit rhetoric, and instead, places emphasis on the institutional and structural forces that inform local practices in schools that systematically disadvantage Latinas/os. From there, I highlight some specific elements of the Latina/o educational experience in America, of which the “funds of knowledge” scholarship is a crucial part, arguing for the necessity of school administrators and teachers to place value on the cultural and sociolinguistic identities and practices that Latina/o students bring with them into the classroom, rather than ignore, sweep aside, or otherwise try to facilitate their assimilation into the normative practices of the mainstream English-speaking White middle-class.

Even more specifically, I deconstruct the practice of tracking as a practice following from deficit discourse logic. However, after understanding

this practice from a structural vantage point, the focus of this section of the chapter will be to frame how this practice shapes students' agency in claiming and performing identities in school. I position each classroom as its own bounded cultural arena (although I use the language of Holland et al. (1998) "figured worlds"). I describe the micro theoretical perspective to understand each student's "voice" as a means of exercising agency and crafting identities while in school.

In this chapter, I also offer a brief synthesis of the various scales of theory I employ, namely to argue for their connectedness through an articulation of the dialectical relationship between agency and structure.

(1.8.2.) Chapter Three (Research Design and Methods)

In this chapter, I provide a detailed overview of the primary research methods employed to collect the data that produced this dissertation. I describe and provide justification of the study population, sampling strategy, informant selection, as well as the types and sources of data collected. These data sources include: daily participant observation in the classrooms accompanied by the composition of detailed ethnographic fieldnotes; two separate interview protocols (i.e., "Being a Science Student" and "Draw a Science Person"); drawing exercises (i.e., students were asked to draw a scientist, a science teacher, a science professional or someone who uses science in their job, and a college science student); and, free-listing, and

rank-ordering exercises (i.e., students were asked to free-list, and then later rank-order, as many expectations [e.g., actions and attributes] of “good” science students as they could think of).

Throughout the research enterprise, I approached each classroom as its own ethnographic case study and I employed a grounded theory approach to guide the processes of data collection and analysis (Charmaz 2000, 2002, 2006); I provide my rationale for doing so in this chapter. Here I also walk the reader step-by-step through my analytical approach: I employed a constructivist-interpretive perspective in making sense of my analytical outcomes (Denzin & Lincoln, 2003) as well as a critical ethnographic approach in the composition of this dissertation as a final product.

(1.8.3.) Chapter Four (Central Findings)

In this chapter, I provide a much more in-depth picture of the students of Amblen Elementary School, in terms of who they are and where they are from, in addition to an overview of the dynamics of their peer group/s in school and how it motivates individuals to act in certain ways. I also highlight the experiences of the students as they move through the fifth grade and especially as they engage with the subject of science. I present each classroom as its own ethnographic case study, and in doing so, I include many descriptive details from the ethnographic fieldnotes I have composed as part of my approach to participant observation throughout data collection.

In this chapter, I also summarize the results of the both interview protocols, conducted separately and individually with each student. One interview, “Being a Science Student”, examines the school science experiences of, and the expectations placed upon, students as well as the ways in which they understand constructs such as *intelligence* and *success* in the science classroom. I recapitulate students’ general feelings about school including some of the important challenges and difficulties they face. I also detail how students understand themselves, and their peers, as competent and/or successful science students based upon their relative placement within either classroom.

Focusing on the subject of science more specifically, the results of the “Draw a Science Person” (DASP) interview, detailed here, demonstrate the extent to which the students in this study affiliate, or do not affiliate, with science as a profession, and especially as a potentially accessible, achievable, and/or appropriate profession. Each student was asked to draw four pictures of “science people” (i.e., a scientist, a science teacher, a college science student, and someone they believe might use science on a regular basis in their profession other than a scientist or science teacher), and then participate in a semi-structured interview about their drawings. I asked students to describe their illustrations, allowing them the opportunity to explain what they felt to be most important. I then asked students what the individual is doing in each picture, and why it is they would do that, as well as

to confirm identifying details in their drawings including age, ethnicity, and gender. Finally, I asked students to tell me about the individuals they had drawn (e.g., their families, hobbies, interests, personalities, etc.), and to consider the attributes, characteristics, and qualities they share—or perhaps do not share—with these individuals, by asking them whom they feel they are most similar to—as well as most dissimilar to—and why. Here I demonstrate that the degree to which students perceive sharing attributes with the figures in their drawings points to how accessible and achievable they believe futures with and/or in science to be.

This chapter goes on to summarize the results of the free-list and rank-order exercises as well, which will reveal how the students of the two classrooms experience different sets of expectations with regard to what it means to be a good and/or smart science student. Here, I demonstrate the relationship between the ways in which students understand constructs such as *intelligence* and *success* as well as perceptions of self, science, and "science people", and how they are impacted by one's placement in one of the two classrooms. I will argue here that students *learn* to present themselves as good and/or smart students differently; intelligence, and the display of it, is not innate but instead actively produced with and through the expectations and reactions of others.

In addition to the academic endeavors that make up a majority of the school day, for both students and teachers alike, students' behavior (i.e., how

it is classified, evaluated, and managed) emerged as a central theme throughout my fieldwork. How students manage their own behavior, and indeed how students' behavior *is managed* by teachers is a chord that pervades everyday school life. In this chapter, I argue for the functional logic of demonstrating "good" versus "bad" behavior, when it is employed, and by whom, all as part of complex strategies that reflect students' varying ideas about school success and how these behavioral enactments are suited to the cultural milieu of each classroom. I show that students are not solely, or even primarily, motivated to achieve *academic* success in school. Students are significantly motivated by, and through, their peer groups and will work to balance success within both domains, while at times achieving success in one domain at the expense of the other.

This chapter also details how Latina/o youth become institutionalized within our education system, using science education as a diagnostic for which to demonstrate this process. Here, I synthesize notions of how students receive science (e.g., the forms it takes as a credible and highly uncontestable epistemological worldview, the activities students participate in, etc.) similarly as well as differently across classrooms.

(1.8.4.) Chapter Five (Conclusions and Implications)

In this chapter, I rearticulate the central themes of this dissertation while highlighting some of my most notable findings regarding the institutional

factors (e.g., policies informed by deficit discourse, etc.) that shape the organizational structure of schools and of classrooms (e.g., the practice of tracking, etc.), and in turn how this engenders disparities in the ways students experience education, namely, in the opportunities that are made available to them. As this dissertation demonstrates in several ways, tracking—while it might facilitate and streamline the duties and responsibilities for administrators and teachers—ultimately curtails the number and types of opportunities for students to achieve and succeed in school. This is indeed the case primarily because the students placed in the lower tracks tend to internalize understandings of self as *less* capable, and *less* smart, than those of their peers in the higher tracks.

To these ends, I will also argue that while there exists a logic behind tracking—at least from an administrative and pedagogical perspective—my empirically-based findings reveal that it fails to provide *all* students with equal opportunities to advance, and furthermore, within a system that proclaims itself to be fair and just at its core, my value-based assumptions lead me to conclude that this practice should be eradicated.

I conclude this chapter, and indeed this dissertation as a whole, by articulating what I believe to be the most crucial implications of this work: we live in a society that congratulates and privileges success, and we often understand one's achievement of such as the result of dedication and hard work. While these components are undeniably necessary to achieve success,

we problematically tend to overlook the fact that not everyone is provided with an *equal opportunity* to succeed. Tracked classrooms fail to provide *every* student with an equal opportunity to succeed. How might our education system be better served if restructured in a way that truly provided equal opportunities for all? Importantly, what sets of challenges and obstacles might we face in attempting to restructure the system in this way? Based on the time I have spent going back to the fifth grade, and what I have come to understand as a result of my research, I will provide answers for these timely questions.

2. CHAPTER TWO: Theoretical Background and Framework

2.1. Introduction

The goal of this chapter is to offer a synthesis of the broader conceptual frameworks employed throughout this dissertation to interpret my central research findings and to provide the theoretical context that supported the development of my primary research questions, as outlined above in Chapter One (Introduction). This chapter proceeds to follow theoretical and conceptual frameworks at multiple scales: from macro perspectives (e.g., the role of education from the position of the state) to micro perspectives (e.g., the ways in which individual students employ agency to craft identities and understandings of self in school). These levels of theory, and how they are in dialogue with one another, provide the necessary context with which to fully understand how and why Latinas/os become tracked in science, as well as the socio-psychological impacts that tracking can have on Latina/o youth and their identity claims and performances in school.

Despite mainstream understandings of schools as meritocratic institutions of equal opportunity, deficit discourse (i.e., the belief that certain students—typically low-income minority youth—must overcome behavioral, cognitive, cultural, and/or linguistic “deficits” if they are to succeed academically) influences education in every dimension: from policy, to the organization of schools and classrooms, to the pedagogical stances taken up

by educators (Foley, 1997; Valencia, 1997; Yosso, 2005). Latina/o students have been historically underserved in the American public education system (Delgado-Gaitan, 1992; Hogg, 2011; Moll, 1992; Villenas, 2001).

Deficit-model explanations, used to engage with minority students' underachievement in school, often imply or claim outright that these students come from culturally-deprived communities (Bulmer & Solomos, 2004; Villenas & Deyhle, 1999), which do not provide them with the tools necessary for school success (Castagno, 2008; Collins, 2009; Monzó & Rueda, 2009; Van Eijck & Roth, 2011; Wortham, 2008). This belief is especially troubling in that it renders the application and performance of certain cultural beliefs, practices, and values that students bring with them to school, not only inappropriate, but *incompatible* with school success (Sampson, 1993; Zuniga, Olson, & Winter, 2005).

Despite the calls for "multicultural education", a more inclusive learning environment whereby diversity is celebrated and seen as a strength rather than a weakness, culturally and linguistically diverse groups of students are still evaluated and rewarded in schools on the basis of how well they have assimilated into the sociolinguistic and normative practices of the English-speaking White middle class (Aikenhead & Jegede, 1999; Brown, 2004; Lee & Luykx, 2006). Most recently, policy debates in the American public education system, have focused on language (Lang, 1995; Revilla & Asato, 2002; Unz, 1997). In this regard, the push for "English only" curricula have

positioned English Language Learners (ELLs) as language “deficient”, thereby disenfranchising and disempowering entire communities of Latinas/os and their children (Lee, Lewis, Adamson, Maerten-Rivera, & Secada, 2008; Villenas, 2001; Zuniga et al., 2005).

Anthropologists have produced critical educational ethnographies of Latinas/os, which have served as an important scholarly response to deficit discourse and have helped to shed light on the educational plight of Latinas/os in America (Cammarota, 2004; Figueroa, 2011; Monzó & Rueda, 2009; Quiroz, 2001; Villenas, 2001, 2007, 2012). This work calls for a reexamination of the deficit rhetoric (i.e., of deficient *individual* students) and instead emphasizes the institutional and structural forces, informing local practices in schools, which systematically disadvantage Latinas/os. This work has helped to reposition schools as active sites in the reproduction of structural advantage and disadvantage alike (Cammarota, 2004; Monzó and Rueda, 2009; Villenas, 2012).

Tracking is a practice that follows from deficit discourse logic, one that has failed to serve minorities whom become more often than not *overrepresented* in lower or remedial tracks (Oakes, 2005). Institutional practices such as tracking can have extremely important consequences for the ways in which underserved minority youth come to understand themselves and others while assigning meaning to their educational experiences (Collins, 2009, 2013).

After having surveyed much of the scholarship concerning Latina/o educational experiences in the United States, and the critical ethnographies that have emerged as a result, I transition to a broader discussion of the importance of science education in America. In doing so, this chapter offers a critical political economy approach to deconstruct the role of the state and the associated assumptions, discourse, and ideologies that undergird the financing and regulating of education in the United States (Collins, 2009; Gradstein et al., 2004).

The underlying issues in education such as the achievement gap, lie not with individual students but instead with the evaluative climate and organizational structure of schools themselves, which reproduce social hierarchies and institutionalized racism (Villenas & Deyhle, 1999). It is *because* the mechanisms underlying this inequality are invisible—ever shrouded in the hegemonic discourse of schools as neutral spaces where everyone is given a fair shot at success—that they are so easily reproducible. Those that succeed are congratulated for their intellectual ability and work ethic, while those that fail are deplored for not working hard enough. We live in a society where we are reluctant to admit that the educational system favors some, while significantly disadvantages others; it seems more convenient to turn the other cheek.

This chapter then goes on to deconstruct the mechanisms of epistemological reproduction both in and through science that occur within

our schools, as they have very important implications, I argue, for the ways in which students come to perceive themselves as learners and doers of science.

This chapter concludes by providing a conceptual framework to understand a particular form of identity (i.e., school science identity), in addition to a theoretical background for gender issues in science. Today, largely missing from the mainstream calculus of equity in science education—but gaining momentum in some academic circles—are discussions of the importance of identity and the impact it has on how youth think of themselves and present themselves to the outside world as they see it (e.g., see Archer et al., 2010; Archer, DeWitt, Osborne, Dillon, Willis, & Wong, 2012; Arnold, 2010; Brickhouse & Potter, 2001; Brown, 2004; Calabrese Barton & Tan, 2010; Carlone & Johnson, 2007; Johnson et al., 2011; Monzó & Rueda, 2009; Shanahan, 2009; Shanahan & Nieswandt, 2011; Tan & Calabrese Barton, 2008b; Urrieta, 2005; Vågan, 2011). As Brickhouse, Lowery, and Schultz (2000) put it, "To understand learning in science…We need to know how students are engaging in science and how that is related to who they think they are" (p. 443).

2.2. Theoretical Significance

Ultimately, the goal of this chapter is to generate an integrated framework for understanding how and why Latinas/os become tracked in

science, as well as the socio-psychological impacts that tracking can have on Latina/o youth and their identity claims and performances in school. I employ theories from multiple scales (i.e., macro to micro) to situate this research enterprise, and doing so is part of my theoretical contribution: By integrating these diverse and individually independent bodies of scholarship and bringing them to bear on a single and extremely pressing and timely issue, I offer a unified framework for understanding all of the dimensions contributing to the impacts that school science tracking have on Latina/o youth.

More specifically, I demonstrate the potential of employing identity as an analytical lens to understand: learning and identity development as mutually constitutive (Lave & Wenger, 1991; Vågan, 2011); Latina/o experiences in school science; and, how students and teachers collectively negotiate constructs such as intelligence and success in the classrooms (Hatt, 2011).

While identity research in science education continues to contribute alternatives to deficit-based understandings of the achievement gap, the theoretical frameworks undergirding many of these studies are narrow in scope. A plurality of identity scholars in science education indeed note the co-constructed nature of identity formation—identities are neither the sole products of individuals (i.e., determined by agents), nor are they wholly directed by forces outside of the individual (i.e., structurally determined)—and yet, many have insufficiently attended to this dynamic and complex process of

co-construction in ways that are both methodologically and theoretically satisfying (Collins, 2009; Shanahan, 2009). Surprisingly few scholars situate their studies of identity in science education within the broader cultural, historical, political, and social contexts necessary to fully capture the power asymmetries that lie at the heart of underrepresentation (Bencze & Carter, 2011; Carter, 2005, 2008a, 2008b, 2010). Without this necessary contextualization, the results of these studies remain limited in their capacity to develop rich connections between what is happening *in* schools with the broader sociocultural realities and processes *outside* of the classroom walls.

(2.2.1.) Structure ←→ Identity ←→ Agency

One of my central theoretical commitments has been to develop a better understanding of the relationship between structure, identity, and agency within school science. Are students' actions limited by—or even determined by—the larger social webs in which they operate? The structure-agency dialectic functions in such a way that individuals' actions contribute to social *reproduction*, but not to social *transformation* (Ahearn, 2001; Ochs & Capps, 1996; Sewell Jr., 1992). Since social change *does* occur, what accounts for it? What role do individuals play in this transformative process?

Social structure refers to the patterns that guide and shape the actions of individuals within groups and communities via social norms, roles, rules, and other pressures experienced by the individuals within these groups (Côté

& Levine, 2002; Shanahan & Nieswandt, 2011). Social structure is produced and reproduced through the interactions between individuals, and *to* individuals, social structure is experienced through the expectations and reactions of others, which guide individuals' actions, behavior, and presentations of self (Burke & Stets, 2009; Shanahan & Nieswandt, 2011; Stryker, 2002). Any social group or space (e.g., classrooms) may have its own social structure/s (Shanahan & Nieswandt, 2011). Given the structural *rules* individuals must navigate daily, how can they help to change the rules of the game?

I contribute to the agency/structure debate by employing identity as an analytical lens. Identities live at the boundaries, or intersections, between agency and structure: while identities are individually authored through one's sense of agency (i.e., one's "Socioculturally mediated capacity to act" [Ahearn, 2001]), individuals always make sense of themselves, while they are made sense of by others, within particular social spaces, thereby influencing both one's presentations and understandings of self (Burke & Stets, 2009; Cerulo, 1997). In other words:

> Who one is and who one desires to be at any given moment is always under negotiation and is contingent upon the resources one has access to and the social, cultural, and historical context in which one seeks to author oneself with and against the expectations of others. (Calabrese Barton et al., 2013, p. 38)

I explore the ways in which students' identities in school are shaped by structure yet generated and given meaning by a sense of agency (Arnold, 2010; Brown, 2004; Calabrese Barton & Tan, 2010; Mallya et al., 2012; Tan & Calabrese Barton, 2008b; Van Eijck & Roth, 2011).

Recent scholarship in educational anthropology and science education offer new insights for how to re-conceptualize the agency-structure dialectic, especially in ways that point to opportunities for more equitable outcomes for underrepresented minority youth (Calabrese Barton & Tan, 2010; Wortham, 2008). Some of these studies have shown in how youth can create hybrid spaces—merging elements from their peer-motivated cultural worlds (e.g., music, slang, etc.) with those of school science in ways that broaden their participation within both of these worlds—thereby calling into question any clear delineations between the cultural spaces inside and outside of school science (Calabrese Barton & Tan, 2010). Such actions have *transformative* potential but only if these actions are deemed credible and legitimate by meaningful others (e.g., peers, teachers, etc.) within these spaces (Carlone & Johnson, 2007; Mallya et al., 2012).

(2.2.2.) Connection to Central Research Questions

Below in Table 1.3., I rearticulate my central research questions and then link them to the various theoretical bodies of scholarship I engage. This table is arranged hierarchically with regard to scale, that is, the macro (i.e.,

broader and/or structural) levels of theory are situated at the top, while the micro (i.e., specific and/or individual) levels of theory are situated toward the bottom. To the right, I indicate which theoretical areas have informed each of my three central research questions, respectively, by assigning the letters that correspond to each question to each area of scholarship.

In what ways do the division of students into groups (based on academic ability (i.e., English language proficiency) and behavior) impact…

(a) …the number and types of opportunities for Latinas/os to succeed in school science?

(b) …how Latinas/os negotiate the concept of 'success' in school science?

(c) …the ways in which Latinas/os claim and perform successful school science identities?

Table 1.3. Theoretical Scale from Structure (MACRO) to Agency (MICRO).

Theoretical Scale	***CRQ (a)**	****CRQ (b)**	*****CRQ (c)**
Structure *(MACRO)*	+		
The Political Economy of Science Education	+		
The Achievement Gap and Deficit Discourse	+		
Critical Ethnographies	+		
Latina/o Educational Ethnographies	+		
Borderlands Scholarship	+		
Critical Discourse Analysis (CDA)	+		
Science as Culture	+	+	
Privileging English in the Classroom	+	+	+
Tracking Latinas/os in Science	+	+	+
Figured Worlds	+	+	+
Funds of Knowledge	+	+	+
Epistemological Reproduction in/through Science		+	+
Race			+
Gender			+
Identity			+
"Passing"			+
Acts of Resistance			+
Agency *(MICRO)*			+

Note: The theoretical bodies of scholarship listed above have been linked to the corresponding central research questions they help to inform.
* Central Research Question (a)
** Central Research Question (b)
*** Central Research Question (c)
(Source: Grayson Ford Maas Dissertation Research, 2015).

2.3. A Word on "Race"

How does one write about race without, to some degree, reproducing the very same classification schemes that so often essentialize and homogenize a group of individuals, rendering diversity and individuality all but invisible? This question remains important and persists despite decades of scholarship on the topic. Perhaps the best, and indeed a necessary,

resolution to this question is to acknowledge the importance of the question itself, rather than trying to find a way out of or around it.

Above all, I must address my own assumptions and clearly articulate my position as a researcher and as a writer, noting the irony of problematizing the labels assigned to groups of people, while at the same time relying on these labels to communicate the very problem of the labels themselves; in this way, to enunciate is to reify. As a scholar, it is precisely because it *does not* go without saying—because I have an obligation to state my position—that when I write about Latinas/os (as I do throughout this dissertation), I do not intend to refer to *all* Latinas/os or to treat individuals who identify as such as one essential and all-inclusive monolithic group. Without making these recognitions clear, I remain open to the criticisms of having engaged in a form of violence, of privileging a label over the heterogeneity of voice and individual experience. Thus, the answer to the question above lies in the very articulation of the question itself, implying a critical awareness of the power of labels, and consequentially, of the power in representation and my duty as a scholar-ethnographer to carefully consider how I go about *representing*.

Race is a word with very much at stake; while there is academic consensus—albeit pervasive public misconception on this point persists—that race is invalid as a biological concept, race (the *social* category) is very real and so are the consequences of its use. (Baker, 2010; Body-Gendrot, 2004; Mullings, Heller, Liebow, & Goodman, 2013; Nanda & Warms, 2012). In its

most basic articulation, race is a culturally constructed category based on the perceived differences among individuals' and/or entire groups' physical features (Smedley, 2007). But race is much more than a category; it is a labeling device in which inequalities in education, material resources, opportunity, power, prestige, privilege, and wealth revolve (Buck, 2001). One's racial classification operates as a marker of structural advantage or disadvantage (Frankenberg, 2004; Mcintosh, 1989), not in an enduring or static sense—although patterns do exist—but forever situated within cultural and historical contexts (Hall, 1991). Yet, race is even still more than an exogenous labeling device, it is a mediating tool for making sense of one's self and of others, an instrument of identity (Cruz, 2012). Although, one's cultural and ethnic sense of self is not fixed, but is continually shaped by context and can be transformed (Holland, Lachicotte Jr., Skinner, & Cain, 1998).

Race is an important concept within the United States, for one, because of the prevalence of racism—in its various forms—especially since so many Americans readily claim that the country has "moved beyond" it (Baszile, 2008). To be fair, in some ways it has, but in others it has only become more deeply entrenched, and invisible. To assume there exists some common denominator within social groups that renders them essentially, and/or naturally, different from other social groups is to engage racism (Bulmer & Solomos, 2004). More precisely, to presume that complex traits

such as intelligence—or cultural traits such as work ethic or character—have any natural concordance with one's physical features, is to engage *one* form of racism: ideological racism (Dei, 2001). Racism, as most popularly conceived, refers to the active racism of discrimination and prejudice. The majority of Americans claim to be unprejudiced, yet, most conceive of racial prejudice only in its *active* form (Roberts, 2011) and fail to see the structural racism that pervades American society, embedded in institutions—as a system of privilege and oppression, of advantage and disadvantage—feeding inequality.

Structural racism remains invisible to most Americans, as it is insulated by the hegemonic discourse of American meritocracy (Baszile, 2008; Castagno, 2008; Gutiérrez & Jaramillo, 2002). It is precisely *because* of this invisibility, that race scholars fight to expose structural racism by bringing it to the light, for racism continues to distribute fortune and misfortune alike, even when its visibly active form remains all but silenced (Castagno, 2008). Public education is one key arena in which the manifestations of institutionalized racism persist (Aikenhead, 2001; Alemán, Jr & Alemán, 2010; Baszile, 2008), as the practices and policies undergirded by deficit discourse (e.g., tracking) demonstrate.

2.4. Critical Ethnography, Achievement Gap, and Deficit Discourse

Latina/o educational ethnographies, and the theoretical interventions that helped shape them, were born out of the debates regarding “minority education” first surfacing in the United States in the 1960s (Delgado-Gaitan, 1993; Villenas, 2012). More precisely, these ethnographies were crafted as *critical* ethnographies, reactionary to the scholarly and mainstream explanations of the persistence and pervasiveness of minority student failure and underachievement (Valencia, 2002). These critical ethnographies were decidedly different in both form and function than the educational ethnographies of their day, which took a systematic and rigorous approach to simply know more about the various intersections between education and culture/s (Anderson, 1989; Carspecken, 1996). Critical ethnographies, on the other hand—equally rigorous and equally systematic—were not motivated by the traditional intellectual pursuit of knowledge generation; rather, these critical ethnographies were on a mission, a mission to *show*, or in other words, “A critical ethnography is a well-theorized empirical study with a serious political intent to change people’s consciousness, if not their daily lives” (Villenas & Foley, 2002, p. 196). Latina/o educational ethnographies were born *as* critical ethnographies, and most notably as reactions to the cultural deficit explanations of the achievement gap problem within the United States educational system (Villenas, 2007, 2012; Villenas & Deyhle, 1999; Villenas & Foley, 2002).

The first articulations of achievement gaps in the United States appear by the 1960s (Coleman, Campbell, Hobson, McPartland, Mood, Weinfeld, & York, 1966; Hauser, McMurrin, Nabrit, Nelson, & Odell, 1964; Walker, 1963). The “Coleman Study” (1966), to which it is colloquially referred, was a landmark report highlighting minority students’ (i.e., African Americans, Mexican Americans, and Native Americans) lower levels of achievement—using standardized achievement scores/grades—relative to White students. Taking this issue seriously—especially because of the long-term implications for national economic security and prosperity—the alarming statistics of the Coleman study helped to directly and indirectly influence a wave of education reforms (e.g., public school desegregation, “Head Start”, etc.) aimed at correcting the problem.

Just beneath the well-intentioned reforms of the day was the essentialist assumption that the cultural and linguistic backgrounds of minorities inadequately prepared them for school success and function to reproduce pervasive patterns of underachievement (Foley, 1997). These assumptions were well reflected in earlier scholarship concerned with understanding the causes of the achievement gap (Trueba, 1988). Such ethnocentric accounts, however, provided little more than Social Darwinist perspectives arguing that the causes of minority underachievement stem from the less fit cultural backgrounds (albeit not less fit *genes*) in which minority children are raised (Valencia, 1997). One influential account of the day was

Oscar Lewis' (1965) "culture of poverty", arguing that urban poor (in this case, Mexican families living in urban Mexico or New York City) live within families and communities that are chaotic and violent, and ultimately promote unproductive attitudes and behaviors. Supporters of the deficit discourse tended to put forth ethnocentric depictions of minority youth as "culturally deprived" to explain their widespread dearth of school success (Ogbu, 1987). Other contributors to this discourse preferred not to paint the picture in such broad strokes, but rather, provided more focused accounts of precisely where such "deficiencies" could be found, such as minorities' linguistic practices (e.g., African American English Vernacular (AAEV), Spanish, etc.) thought to be less complex in grammatical function than the linguistic practices of individuals from dominant groups (Bernstein, 1975). A shared assumption among many of the early deficit theorists was in where they were willing to locate the epicenter of deficiency: most of the time, to be found within the *individual*. However, despite the expansion of deficit thinking, several accounts, even as early as the 1960s (Foley, 1997), sought to critique deficit theories, offering fresh insight into the problem of inequality (e.g., of access, of outcomes, etc.) in education.

One of the well known arguments of social inequality in education comes from the contributions of Neo-Marxist accounts of schools' role in the reproduction of class inequalities, arguing that the structure of schools within capitalist societies only further entrench many minority students' acceptance

and subscription to unequal class assignments, despite schools' tacit and explicit promises of upward mobility (Villenas & Foley, 2002).

Another challenge to deficit thinking came from sociolinguists expressly seeking to discredit the notion that minority educational underachievement could be due to deficiencies found within and among the languages and linguistic practices of minorities (Heath, 1983; Philips, 1983). These educational researchers employed a relativistic approach to explaining school failure, and insisted that minority youth's languages and ways of speaking, if different from the normative linguistic practices of the White middle class, were not inherently (e.g., grammatically, semantically, syntactically, etc.) deficient but rather optimally suited to nonmainstream sociocultural milieu, yet marginalized and undervalued within school contexts (Villenas & Foley, 2002). This, the argument continues, is because the culture of schooling in the United States most closely resembles the culture of White middle-class America, its values, and its ethnolinguistic practices (Monzó & Rueda, 2009). Thus, minority students' underachievement within school contexts is better understood as resulting not from deficient students, but rather, from these students being disadvantaged by an educational system that only recognizes one language, and certain ways of speaking it, as credible and legitimate (Collins, 2013). Sociolinguistic studies in this area, however, went further than earlier Neo-Marxist accounts because they were able to demonstrate value-based mismatches between certain linguistic

practices students bring with them into schools, with those typically valued in schools (Collins, 2009; Moll, 1992; Wortham, 2008). Indeed such work has done much to reframe the deficit debate. Educational anthropologists began to argue that youth from non-dominant ethnic and racial groups were not culturally deprived, but rather, that the culture of schooling in America was "discontinuous" with culture/s outside of the dominant White middle-class culture (Ogbu, 1982, 1987; Torrance, 1962).

While these early ethnographic accounts were helpful in thinking through the politics of school achievement, they were still limited in their explanatory and exploratory potential because they continued to revolve around structural interpretations of the mechanisms that reproduce educational inequality (Collins, 2009). For example, John Ogbu's (1987) cultural ecological model posits that a youth's worldview is strongly influenced—if not *determined*—by the socio-historical positioning of the ethnic or racial group to which s/he belongs, and that one's academic achievement is likely to reflect their group's position. If true, how might one ever expect a real shift toward educational equality? Ogbu's accounts were so structurally influenced that he viewed minority school success as possible only at the expense of foregoing one's own ethnic or racial identity; for Ogbu, if one was not White, then one had to "act White" in order to succeed in school (Ogbu, 1987). Ogbu's argument, in many ways, recapitulates previous scholarly and literary accounts of the plight of African Americans in American society—such

as Franz Fanon's (1967) *Black Skin, White Masks* and Ralph Ellison's (1952) *Invisible Man*, respectively—which, in their own ways, argue that in order for African Americans to succeed in America, they must generally act, behave, dress, and speak as White Americans stereotypically do. Ogbu saw minority underachievement within schools as an outcome of when students make the decision to privilege their own ethnic and/or racial identity *instead of* "masquerad[ing] as the authentic, idealized 'Other'" (Fordham, 1993, p. 26) in school, or as Fanon (1967) would put it, wearing the "White mask".

Well intentioned though they may have been, these expositions too often blurred the lines between culture and race to the point where it was no longer possible to tease the two apart (Atwater, Lance, Woodard, & Johnson, 2013). One of Ogbu's larger oversights, for example, is that he described an oppressive educational system wherein it was virtually impossible for any minority youth to experience school success *on their own terms*. This implicit essentialism warranted a different approach, one that could speak to individual agency and empowerment (Suárez-Orozco, 1987), not just resistance and subordination. Latina/o educational ethnographers, in particular, did much to offer a broader and more nuanced picture of Latina/o students, the difficulties they face, as well as the resiliency they continually demonstrate to succeed in school despite the discrimination they face.

2.5. Latina/o Educational Ethnographies and the Borderlands

In response to the cultural essentialism in early scholarship that all but predetermined youth's actions in the educational system (Villenas, 2012), the late 1980s and early 1990s marked some of the first concentrated efforts by anthropologists to produce Latina/o educational ethnographies arguing for the resilience and strength of Latina/o youth (Delgado-Gaitan & Trueba, 1991; Trueba, 1988; 1989; 1991; Trueba, Spindler, & Spindler, 1989).

Around the same time, the work of Concha Delgado-Gaitan expanded the boundaries of where one could locate one's research focus in Latina/o education, and consequentially, within educational ethnography as well. Delgado-Gaitan argued that the cultural practices of the home (e.g., storytelling, family and community linguistic practices, etc.) are all important forms of education (Delgado-Gaitan, 1992, 1993, 1994; Delgado-Gaitan & Trueba, 1991). Education no longer needed to be located within the confines of the classroom. Extending educational analyses beyond the purview of schools by finding it within homes and across families and communities, Latina/o educational ethnographies employed empowering vocabulary, such as those included in the cultural borders, borderlands and border-crossing metaphors (Delgado-Gaitan & Trueba, 1991; Delgado-Gaitan, 1994; Villenas and Deyhle, 1999), as well as "funds of knowledge" scholarship (Calabrese Barton & Tan, 2009; González, Moll, & Amanti, 2005; Hogg, 2011; Moje,

Ciechanowski, Kramer, Ellis, Carrillo, & Collazo, 2004) to capture the voice and experience of Latina/o youth within the American education system.

"Borderlands" scholarship developed as a theoretical tool to capture the lived realities of many transnational Latina/o families in the United States, many of whom operate in creative and dynamic ways to reconcile the multiple and interacting webs of cultural meaning (Delgado-Gaitan & Trueba, 1991) they negotiate within modern America. The notion of cultural *interaction* is paramount here, in that the act of border crossing is not the movement from one clearly demarcated cultural boundary (e.g., Latina/o culture) into the next clearly demarcated cultural territory (e.g., mainstream American culture), and back and forth and so on (Vásquez, Pease-Álvarez, & Shannon, 1994). Instead, this dynamic cultural interaction becomes visible during moments that require creative strategies for making sense of challenges faced by Latinas/os in the United States. For many Latinas/os, navigating the American education system represents one such challenge (Delgado-Gaitan & Trueba, 1991).

The concept of a well-educated (*bien educado*) person within many traditional Latina/o households refers more so to one's moral foundation than to one's scholarly training (Villenas & Foley, 2002). This moral foundation is typically transmitted to individuals in the home, as they learn what it means to be a member of the family collective or community, a unit that is generally

privileged over the individual (Delgado-Gaitan, 1992, 1993, 1994; Delgado-Gaitan and Trueba, 1991; Váldes, 1996).

The notion that one's allegiance is ultimately to one's family and not to one's self, in turn, shapes how individuals perceive the concept of *success*. For example, for many traditional Mexican families living in the United States, one's *individual* successes are not necessarily as esteemed as one's abilities to contribute to the well-being of one's family or community through honest and hard work (Váldes, 1996). This conception of success is in sharp contrast to the popularly held notions of success in mainstream American culture, which tends to privilege individual achievement—and most commonly the accumulation of monetary wealth—as *the* barometer for success. Latina/o students may come into classrooms with a different set of assumptions—having been exposed to different narratives in the home—for what counts as success, which may be inconsistent or incompatible with the narratives they receive in school. These different notions of success have important implications for understanding educational achievement as well.

Aspects of cultural knowledge (e.g., learning to interpret what counts as success, etc.)—and the different value orientations between working-class Latina/o families and middle-class White families—are typically transmitted to children through socialization processes in the home, and for Latina/o children in particular, often through the use of advice-giving narratives (*consejos*) (Delgado-Gaitan, 1994). Latina/o educational ethnographers have

produced detailed accounts of how transnational families draw from traditional cultural practices, such as *consejos*, and employ them within the context of new cultural milieus such as schools (Moreno & Valencia, 2002). For instance, Mexican American families may encourage individual achievement in school *through consejos* (Romo & Falbo, 1996). Doing so is a negotiation, a cultural collaboration, employed by transnational Latina/o families operating within the context of the American mainstream, yet doing so on their own terms.

Weighing in on the deficit discourse, borderlands perspectives helped to recast Latina/o youth not as "culturally deprived", but instead, demonstrating how the cultural values of Latina/o families *do* promote and prepare youth to achieve success within the American education system (Moreno & Valencia, 2002). Sofia Villenas thinks of this work as inherent activism-scholarship, writing of Latina/o educational ethnographies as "*ethnographies de lucha*", or ethnographies "of struggle"—indeed, this is the title of one of her recent articles in *Anthropology & Education Quarterly*—noting that "This work was [and still is] clearly 'talking back' if not fighting back at the discourses…that served to inform deficit-based responses to Latina/o family cultural lives and youths' education" (Villenas, 2012, p. 16).

One of the most powerful and enduring contributions of Latina/o educational ethnographies has been in bringing to light the repeated failures, not of individual students, and not of their cultural backgrounds and linguistic

practices, but of the schools themselves (Foley, 1997). From a borderlands perspective, schools generally fail to understand and appreciate that "Latina/o children are socialized differently in their families and communities; they participate in diverse cultural and linguistic worlds; they enact multiple identities in different contexts; and they achieve differently in schools" (Villenas & Foley, 2002, p. 212). From this view, schools fail students, and not the other way around, because they are resistant to drawing on the diverse backgrounds and strengths students bring with them into schools. Instead, Latina/o educational ethnographies have framed schools' Eurocentric and "English-only" curricula and evaluative practices as debilitative, reinforcing institutionalized racism by systematically disenfranchising Latina/o students and prohibiting their equal opportunity to achieve school success (Romo & Falbo, 1996; Váldes, 1996; Valencia, 2002; Vásquez et al., 1994).

Public schools in the United States operate under the assumption that pedagogical techniques and practices—and the educational theories that support them—are neutral in that they do not put some students at a distinct advantage, while putting others at a distinct *dis*advantage. One example of this lies in the teaching techniques employed by primary and secondary school teachers alike, which most closely resemble the linguistic and parenting styles of the White middle class (Reyes, 1992, 2001). Another example of the presumed pervasive neutrality in American public school culture lies outside of the formal evaluative and pedagogical practices, and

instead has to do with assumptions concerning the qualitative nature of parental involvement (Váldes, 1996). Latina/o educational scholars have been critical of the un-reflexive stance that many schools and teachers adopt, namely, the ethnocentric presupposition of the White middle-class model of family function, home structure, and parent-child relationship as normal and standard (Moreno & Valencia, 2002; Villenas and Foley, 2002). Teachers and school administrators, often unknowingly, communicate and interact with students under such prescribed sets of assumptions—assumptions that go unacknowledged because they are seen as normative.

Shared assumptions regarding relatively uniform family function and structure have proven to be a source of consternation and tension for Latina/o families, upset by the lack of communication and understanding on the part of the schools which their children attend. In some cases, parents have mobilized to raise awareness and fought to change the practices of local school districts that fail to provide adequate services and support to their children. During the mid-1990s in Carpinteria, California (just 11 miles south of Santa Barbara), Latina/o families became fed up with the dearth of clear and transparent communication from school administrators and teachers regarding the educational statuses of their children and what—if anything at all—was being done to help them. These concerned parents organized grassroots efforts to broaden and deepen the channels of communication between themselves and the schools in the Carpinteria School District,

culminating in the establishment of COPLA (*Comité de Padres Latina/os*) (Delgado-Gaitan, 1996). This committee was able to carve out a productive space whereby they could remain permanently involved in the academic lives of their children by cooperating to instill and oversee specific changes—for example, in "English as a Second Language" (ESL) curricula, the hiring of bilingual educators, ensuring school correspondence in Spanish as well as in English, etc.—which ultimately led to greater school success and a more enriching educational experience for many Latina/o youth (Delgado-Gaitan, 1996).

Despite the many accomplishments and advancements of Latina/o educational ethnographies, deficit thinking still pervades much of the mainstream educational landscape in the United States (Castagno, 2008; Hogg, 2011; Masten, 2001). This is still well reflected in achievement gap discourse (Calabrese Barton et al., 2013; Carlone et al., 2011; Rothstein, 2004), and becomes only further reinforced by education reforms that still assume schools to be meritocratic institutions of equal opportunity, thereby rendering invisible the power asymmetries that reproduce structural advantage and disadvantage alike (Cammarota, 2004; Monzó & Rueda, 2009). But there is a way forward, and many positive and promising scholarly trajectories have been established, carving a path in the push toward equality. As part of a borderlands perspective that insists on the strength and resiliency of Latina/o youth—and how this understanding can be used to forge a

productive “third space” (Calabrese Barton & Tan, 2009; Gutiérrez, Baquedano-López, & Tejeda, 1999; Moje et al., 2004), that is, neither reproducing the cultural space and normative practices of the home nor the classroom—one of the most successful tools to come out of the past two decades of Latina/o educational ethnographies has been the concept of “funds of knowledge”.

2.6. Funds of Knowledge

The term “funds of knowledge” was first used by anthropologist Eric Wolf (1966) as a way to describe the various forms of cultural knowledge and resources that peasant households in Mexico use to get by (e.g., caloric funds, monetary funds, social funds, etc.). Several decades later, anthropologist Carlos Vélez-Ibáñez employed Wolf’s concept to his own ethnographic work with vulnerable Mexican border communities, arguing that funds of knowledge function as the accumulation of cultural knowledge about practices—ranging from homemaking to traditional medicinal remedies—strategically disseminated and exchanged within complex and diverse social networks from families to neighborhoods in an effort to help them sustain livelihoods (Vélez-Ibáñez, 1988).

Vélez-Ibáñez’s conceptual framework was ultimately picked up by a group of scholars at the University of Arizona (Luis Moll, Norma González, and James Greenberg) who then demonstrated its exploratory potential in

classrooms and schools (Hogg, 2011). This group used the funds of knowledge framework to counter deficit theories about Latina/o youth including their families and cultural backgrounds, much in the same way that Latina/o educational ethnographers engaged borderlands perspectives and critical ethnography to accomplish the same ends (González, Moll, Tenery, Rivera, Rendon, Gonzales, & Amanti, 1995; Moll, Amanti, Neff, & González, 1992; Moll & Greenberg, 1990; Moll, 1992). Indeed, it was precisely in its use in rebutting deficit theories that the funds of knowledge model began to gain greater recognition by fellow educational anthropologists.

The arguments of Moll, Gonzalez, Greenberg shared similarities with those of the borderlands theorists in recognizing that neither individual students nor their cultural and familial backgrounds can explain patterns of academic underachievement, but rather, teachers and schools fail to give voice to the diverse cultural backgrounds and linguistic practices of *all* students. And further, they believed, if equal value were to be placed on students' cultural experiences and sociolinguistic practices (i.e., their "funds of knowledge"), that this would translate into a greater likelihood of them achieving academic success (González et al., 1995, 2005; Moll et al., 1992). They reasoned that if important elements of Latina/o students' cultural identities (e.g., the languages they speak, the food they eat, the holdiays they celebrate with their families, etc.) were valued equally in the classrooms alongside the cultural practices of the White mainstream middle-class, then

these students that were previously disenfranchised and exluded, and perhaps made to feel inferior, would feel more motivated to achieve academically, because they would feel like they are a part of a commuity in which they are included and empowered. This work is based in large part from the observations that teachers and schools tend to reproduce, unintentionally or not, the privileged normative practices of the dominant mainstream culture most closely resembling the English-speaking White middle class (Carlone et al., 2011).

"The potential of this [funds of knowldege] approach lies in its ability to identify what is, rather than what is not; and to engage with individuals, rather than assumptions and stereotypes" (Hogg, 2011, p. 667). Linda Hogg indeed notes this as an "approach" because of the built-in implication for better teaching practice; or in other words, the funds of knowledge perspctive operates as an *applied* perspective, and intentionally so. This perspective, if truly embraced, necessitates that teachers become more reflexive about *which* funds of knowledge they recognize as valuable and appropriate, worthy of being reproduced and acknowledged as credible and desirable in the classroom (Sleeter, 2008; Villegas & Lucas, 2002). Further, teachers must carve out productive spaces for sudents to let their individual funds of knowledge shine within the classrooms. Such a prescription assumes that teachers generally fall short of practicing this brand of cultural relativism, and rather—often unknowlingly—call upon the experinces and cultural knowledge

most often associated with the English-speaking middle-class White students, thereby marginalizing and effectively silencing Latina/o students' voices at the same time (Castagno, 2008).

In several ethnographic accounts employing a funds of knowledge persepctive, teachers from White middle-class backgrounds have been found to reproduce White middle-class values and normative practices, while demonstrating far less understanding and support for the funds of knowledge minority students bring with them to the classroom, as evidenced by the significantly decreased solicitations for their participation, among other things (Sleeter, 2008; Villegas & Lucas, 2002). Funds of knowledge scholars acknowledge that K-12 teaching approaches are relativlely homogenized as a result of the very funds of knowledge that *teachers* bring with them into classrooms; but perhaps more importantly, teachers remain largely unaware of their privileged social position in relation to students from very diverse backgrounds, thereby influencing similarly homogenized assumptions regarding the funds of knowledge that students are supposed to bring into the classroom as a consequence (Sleeter, 2008). A proposed remedy to this highlights the importance of the teacher-student dynamic (Hawk, Cowley, Hill, & Sutherland, 2002) and suggests that teachers should work not just *as teachers* but as reflexive ethnographers to try to experience, or at the very least, learn about the backgrounds from which their students come (González et al., 1995). Doing so should not only be in the service of better cultural

understanding, the argument continues, but should ultimately result in the greater potential for teachers to draw on students' funds of knowledge in the classroom in meaningful ways that translate into school success for all and greater equity (Hogg, 2011). In other words, if teachers were to understand a bit more about who their students are, and where they come from, it would allow them to engage their students more appropropriately, leading to many more meaningful opportunities for them to participate.

Thus, a teacher's role in the classroom is never neutral; students are always in the process of interpreting which values, ways of knowing, and behaviors are not only appropriate but desirable (Calabrese Barton et al., 2013; Collins, 2013). This view presupposes that the role of teachers extends far beyond disseminating content knowledge to students whom thereafter merely acquire or do not acquire it. This also necessitates adopting a sociocultural perspective on learning (Vågan, 2011), namely, that learning is not just an individual act of knowledge *acquisition* but rather an active process of *becoming*, that is, becoming a credible, equal, and worthy participant within a particular community of practice (e.g., classroom) (Lave & Wenger, 1991).

Education reforms guided by funds of knowledge perspectives, in the service of multicultural education, call for a reorientation of teacher lesson planning and preparation—one that revolves around the learner (i.e., their needs, their funds of knowledge, etc.) and not just content standards (Villegas & Lucas, 2002). This highlights the importance of teachers being lifelong

learners within the ever-changing classroom communities of which they are a part (Darling-Hammond, 2002)—learners of their students' needs and identities (Gillette, 1996), seeing students as unique individuals that are not readily classifiable into common typologies based on academic achievement and performance (e.g., low-functioning students, high-functioning students, etc.). One crucial step necessary to see students as individuals—and to let them develop identites in school compatible with achieveing success while privileging their own funds of knowledge—is to recognize and to create a meaningful space for students' expression of their individual voice.

2.7. Critical Discourse and Language in the Classroom

Parts of one's cultural funds of knowledge are one's sociolinguistic productions, and these productions are the means by which we share our *voice* (Hymes, 1996). Language is not only the body and practice of acoustic patterns guided by grammatical, semantic, and syntactical rules, it is also a means to perform identity, and often functions as a marker of one's cultural and social membership (Brown, 2004; Hay & Drager, 2007; Kane, 2012; McInnes & Corlett, 2012; Monzó & Rueda, 2009).

At stake for Latina/o youth in the ongoing debates regarding the causes of and solutions to the achievement gap, is the discussion of languge, especially for bilingual students that are educated and evaluated within the context of many English-only school curricula (Monzó & Rueda, 2009; Váldes,

1996), as are the students that have participated in this research. However, this is not simply a matter of *mis*communication or *mis*translation; powerful educational discourses (Collins, 2013) are at work in shaping day-to-day pedagogical practices as well as the debates that frame education reform (Bessell, Burke, Plaza, Lee, & Schumm, 2008; Rothstein, 2004).

(2.7.1.) Critical Discourse Analysis (CDA)

Dissecting the relationship between language and power is important for understanding the hegemony that operates within the United States education system. One approach to this, known as critical discourse analysis (CDA), developed in the 1980s as a branch of discourse analysis (which has its foundations in linguistics) yet is generally employed to address the socially-mediated aspects and consequences of language *use* rather than the study of language in and of itself (Grbich, 2007).

Discourse analysis is not the study of language per se but rather how, when, why, and under what conditions language is used by whom and for which purposes. “Discourse is socially constitutive as well as socially conditioned. Furthermore, discourse is an opaque power object in modern societies and CDA aims to make it more visible and transparent” (Blommaert & Bulcaen, 2000, p. 448). For many employing CDA, there is a built-in activist dimension; it is scholarship with a goal—just as with critical ethnographies—merely uncovering *how* discourses are shaped by oppressive structural

conditions, which consequentially maintain and reproduce power relations, is not enough. Instead, “CDA’s locus of critique is the nexus of language/discourse/speech and social structure…analyzing them should have effects in society: empowering the powerless, giving voices to the voiceless, exposing power abuse, and mobilizing people to remedy social wrongs” (Blommaert & Bulcaen, 2000, p. 449). For these reasons, CDA has been a powerful tool for examining the distribution of advantage and disadvantage in education (Chouliaraki, 1998).

The theoretical foundation of CDA rests on the dialectical relationship between language and social structure (Bourdieu, 1994), or in other words, how the social use/s of language and how they are received continually shape and are shaped by patterned evaluations of one’s utterances at local, institutional, national, and even global scales (Blommaert, 2005). Taking the case of language in education, there is very much at stake because children’s language use/s are significantly impacted by powerful educational discourses that can either present opportunities or obstacles for students in school; sociolinguistically-oriented educational ethnographies continually demonstrate this (Collins, 2013). Questions of *voice* become salient here, including: Whose voices are silenced? (Castagno, 2008) Whose voices are acknowledged as credible? (Carlone and Johnson, 2007) Whose voices are accepted as appropriate and desirable? (Monzó & Rueda, 2009) Investigating

these questions provides insight into how inequalities are maintained within classrooms.

To better understand the complex relationship between education, inequality, and voice, it is crucial to unpack the mechanisms of *recognition*. Recognition refers to the degree of acknowledgement one receives from meaningful others (Carlone & Johnson, 2007; Mallya, Mensah, Contento, Koch, & Calabrese Barton, 2012)—as well as the degree of acknowledgement one assigns oneself—as a legitimate and worthwhile participant within one's particular community (e.g., classroom) or social group (e.g., peer group) (Holland & Eisenhart, 1990; Holland et al., 1998; Lave & Wenger, 1991). Recognition also entails the "freedom to have one's voice heard" as well as the "freedom to develop a voice worth hearing" (Hymes, 1996). "Worth", however, is a negotiated outcome of the ongoing production of group interaction, shaped by history and powerful political discourse (Claussen & Osborne, 2013).

One of the most fundamental contradictions to arise from the critical ethnographies and CDA's of schooling in the United States, is precisely that while schools purport to open the doors of equal access and opportunity for all students, they generally only recognize the cultural performances, funds of knowledge, and sociolinguistic practices of White middle-class America as credible and appropriate (Collins, 2009). This hegemonic ideology actually helps to maintain structural inequality in American education, the diametric

opposite of what it purports to rectify. Within this system, many students from non-dominant backgrounds have been and continue to be the targets of active and implicit discrimination (Monzó & Rueda, 2009). Latina/o youth are of no exception.

(2.7.2.) Privileging English in the Classroom and Proposition 227

From a critical race theory (CRT) perspective—more precisely, from a Latina/o critical race theory perspective (LatCrit)—Latina/o students are generally positioned unequally to White students on the basis of language, but specifically, one's mastery of the English language (Olsen, 1997). Indeed, several LatCrit education scholars interpret the privileging of English over any other language, especially Spanish, in the classroom as systemic discrimination and disenfranchisement of Latinas/os whereby language has come to serve as a stand-in for race (Gutiérrez & Jaramillo, 2002; Monzó & Rueda, 2009; Revilla & Asato, 2002; Valencia, 2002; Villenas, 2012). These scholar-activists press further by arguing that this is the result of hegemonic ideologies veiled in discourse of progress and unity (e.g., "one nation, one language" [Lang, 1995]). Sofia Villenas (2001) terms this particular brand of double-speak as "benevolent racisms", or, the ethnocentric notion that native English speakers are "helping" speakers of minority languages to assimilate to the idealized English-only norms of the United States (Monzó & Rueda, 2009), and furthermore, that policies enforcing such ideologies should help

them to help themselves. There is indeed irony in the notion that while the majority of Americans claim to be colorblind and find active racism distasteful, perceptions of the most appropriate, professional, and valued language and how one chooses to speak it (e.g., accents, dialects, use of slang, etc.) is an issue still widely debated in American society. This is especially true within education and is well reflected in the political sphere as well.

"English for the Children" as it was labeled on the ballots in 1998 (referring to Proposition 227) was created with the goal to reform bilingual education in California, namely, by eradicating it in favor of strict a English-only curricula in public schools (Revilla & Asato, 2002). The rationale was largely the same as of years past: achievement gap statistics of minority youth, especially California's Latina/o migrant youth (Gutiérrez et al., 1999; Gutiérrez & Jaramillo, 2002), would be ameliorated if *every* student participated in English-only learning environments; after all, standardized tests (the implementation of which produce achievement gap statistics) are crafted exclusively in English.

Ron Unz, a Silicon Valley entrepreneur, runner-up candidate in the 1994 Republican gubernatorial primary, and one of the chief supporters of Proposition 227, promoted the slogan "Let's teach English to all of America's children and end bilingual education nationwide" as part of his "One Nation/One California" campaign, insisting that *the* solution to closing the

achievement gap would be in immediate and “structured English immersion” for all English Language Learners (ELLs) (Unz, 1997).

In June 1998, Proposition 227 passed by a majority vote of 61%, and since then, similar measures in other states with significant Latina/o populations have been proposed and/or passed (e.g., Arizona’s Proposition 203 passed in November 2000 by a majority vote of 63%). According to the Proposition 227 mandates, all ELLs must be placed in strict English-only immersion classrooms for a period of no longer than one year, unless the students’ parents apply for a waiver of this requirement on the grounds that their child either: already possesses sufficient knowledge and application of the English language; has been determined to have “special needs”; or, could learn English more efficiently via alternative means and/or sources. Today, such waivers are the only reason that some California public schools are still allowed to maintain bilingual instructional programs (Revilla & Asato, 2002). The impacts of Proposition 227 have either significantly lessened, or in most cases completely eradicated, bilingual education in California public schools. Under threat of lawsuits and various other legal sanctions imposed on teachers in violation of Proposition 227, the complete elimination of bilingual education looms large today (Revilla & Asato, 2002).

(2.7.3.) "Passing"

For Latina/o youth and other minority students, the process of "authoring the self" often involves the understanding of one's self through the lens of powerful others, including dominant groups such as native English speakers (Monzó & Rueda, 2009). Because of what have been understood to be language barriers or cultural differences, many Latina/o students experience prejudice and less recognition from meaningful others (e.g., peers, teachers, etc.) as competent individuals capable of succeeding in school (Valencia, 2002). What is more, Latina/o students seem to be aware of their differences and experience pressure to fit in within ethnically/racially diverse school classrooms (Olsen, 1997). Of course, "fitting in" implies the existence of a cultural ideal type (Dennis Korth, 2007), or an ideological standard to which everyone else is judged in relative degrees of similarity, or in Latinas/os' cases, *difference*. Nevertheless, fitting in may be practiced by Latina/o students as an intentional strategy to achieve a feeling of acceptance and normalcy (i.e., not being "deficient") within the classroom, often by presenting oneself in ways that presuppose a greater level of English fluency, among other things, than one actually possesses (Monzó & Rueda, 2009).

Lilia Monzó and Robert Rueda (2009) investigate the relationship between language use and identity among fifth-grade Latina/o youth in California, in an elementary school they refer to as La Fuente. In their two-year ethnographic study of students they follow from the fifth grade through

the sixth grade, they find many of the students to intentionally exercise a strategy known as “passing”.

“‘Passing’ here refers to the use of strategies to appear more competent in English than was actually the case…passing for English fluent may be both a strategy of self-preservation [i.e., to protect oneself from feelings of shame] and a form of resistance” (Monzó & Rueda, 2009, p. 20). Passing may be accomplished in several ways: by providing an affirmative response and/or not asking teachers for clarification on instructions given in English, despite the fact that they have not been fully understood; by not asking teachers to speak more slowly or to repeat themselves; mumbling or reading very quietly on purpose during read-aloud activities so that teachers and peers would not detect pronunciation mistakes; and, appearing busy so as not to get called upon to participate aloud in English (Monzó & Rueda, 2009). Students may employ the passing strategy as a front (Goffman, 1959), or a “mask” of sorts (Fordham, 1993; Ogbu, 1982, 1987), as the presentation of an ideal identity, one that is both recognized and rewarded by meaningful others such as teachers (Carlone & Johnson, 2007).

Passing demonstrates an implicit awareness on the part of students of power asymmetries of the and privileged status of the English language in relation to Spanish (Monzó & Rueda, 2009), an awareness that Latina/o students have learned to employ in crafting their presentations of self with the expectation that these presentations will be interpreted in semi-predicatable

ways: “One cannot pull off being a particular kind of person (enacting a particular identity) unless one makes visible to (*performs* for) others one’s *competence* in relevant practices, and, in response, others *recognize* one’s performance as credible” (Carlone & Johnson, 2007, p. 1190). Passing affords students the opportunity to perform identities as good students: when asked what constitutes being a “good” student, many students at La Fuente agreed that it entails getting good grades, speaking English well, and not needing too much assistance in completing assignments (Monzó and Rueda, 2009). The inverse, of course, implies that students that *cannot* speak English well and are in need of assistance are *not* “good” students.

Passing is not only a strategy of self-preservation, but part of a claim to a desired identity (Oyserman, Brickman, & Rhodes, 2007). Indeed, when one’s “possible selves” (i.e., one’s self-referential future expectations of self, good or bad) become one and the same as one’s hoped-for selves, and are seen as attainable, possible selves can become expected selves, ones which individuals may actively invest in (Oyserman, Brickman, & Rhodes, 2007). The implications for Latina/o ELLs are clear: the ways in which students perceive themselves as learners and speakers of English—and how meaningful others perceive them in these ways (Carlone and Johnson, 2007)—can shape their actions, or inactions, in school thereby impacting learning outcomes, success, as well as perceptions about accessible, achievable, and appropriate future identities and life trajectories.

Even more broadly, passing is not only a strategy used to achieve acceptance within classrooms, but serves as a microcosm for Latinas/os desire to "fit in" within American society writ large (Reyes, 1992). Evidence for this claim rests upon students linking ideas about language with citizenship: students at La Fuente agreed that one could only be truly "American" if they spoke English very well, irrespective of having been born in America or not (Monzó & Rueda, 2009). Students at La Fuente actively practiced passing strategies despite the fact that almost every student at La Fuente spoke Spanish and identified as Latina/o.

Latina/o students seem to be aware of the second-class status of the Spanish language in America as suggested by their recognition of its relegation to the domestic sphere, spoken with far less regularity in public domains, and further, by noting correlative patterns between race and language use with class and economic inequalities (Monzó a& Rueda, 2009). For example, during individual interviews, one student spoke about their experience in going to the doctor's office, explaining that the nurses and office administrators were usually bilingual Latina/os (in their words, "people like me"), while the doctors (i.e., the ones with power and prestige) were usually English-speaking White males (Monzó & Rueda, 2009). While these fifth-grade students are largely unaware of the structural racism that pervades American society, they nevertheless *experience it* through their desires to fit in by passing (Villenas & Deyhle, 1999).

(2.7.4.) Acts of Resistance

Despite pressures to assimilate, many students actively oppose or resist the passing option, choosing instead to engage in ethnolinguistic practices and/or other cultural performances as part of a strategy to privilege one's own cultural identity (Brown, 2004). During instances where students intentionally and repeatedly perform identities in opposition to the model promoted and supported by the classroom or school (e.g., intentionally failing to "play the game" (Urrieta, 2005) as the dutiful English language learner)—a strategy of resistance—these performances are often misinterpreted by teachers and by other authority figures as indicators of students' inability or unwillingness to comply with what is demanded of them behaviorally and/or scholastically (Becker, 2010; Cammarota, 2004; Gillette, 1996). These interpretations, however, are often generated by teachers without much cultural understanding of *why* students interact and respond in certain ways, and instead assuming that these students have academic and/or behavioral "problems" that demand "correcting" (Becker, 2010).

Interacting with students under the presupposition that there *is*, and *should be*, a model approach to behavior, interactions, and speaking in school, and that it is in students' rational best interests to do so, mistakenly assumes that every student *is*, and *should be*, primarily motivated by outcomes such as good grades and/or praise from teachers (Holland & Eisenhart, 1990; Kane, 2012). It is equally understandable, and rational, for

students to resist behaviors and practices that would normally result in school success, if that individual believes they will experience, or has experienced, identity conflict in doing so (Brown, 2004; Johnson et al., 2011), or equally plausible, if there exist rewards different from—and perhaps even more valued—than those indicating academic success (e.g., good grades) (Holland & Eisenhart, 1990).

Theoretically, it is common to interpret acts of resistance as somehow *more* agentic than acts of acceptance, that is, individuals truly exercise their own will only when they are opposing the status quo (Ahearn, 2001). However, if agency refers to an individual's "socioculturally mediated capacity to act" (Ahearn, 2001, p. 112), as I understand it to, then this stance should be questioned, because *all* action is constrained by, enabled by, and in relation to, culture and social structures whether the action itself is one of resisting or falling in line. In the case of the students of La Fuente, they intentionally developed "strategies that would allow them to pass for a more valued social position, that of fluent in English…Passing, then, can be understood as an agentic strategy for mediating the ways in which they were viewed by others and how they viewed themselves…Passing can [also] be seen as a form of both individual and collective resistance" (Monzó and Rueda, 2009, p. 37). Provided the structural constraints of their classroom and school—in many ways reflective of the structural constraints faced by ethnic and racial minorities within American society—the students of La

Fuente exercised their individual will as agents in complex and meaningful ways, whether by actively accepting the inequality built into their classroom culture, or by challenging this subordination through various forms of resistance.

Contemporary research concerning how ethnic and racial minority students navigate the structural inequalities embedded within the public schooling system of the United States have employed language as an analytical construct to understand agency and identity (Arnold, 2010; Calabrese Barton & Tan, 2010; Brown, 2004; Kane, 2012), by decoding how individuals use language to communicate their identity to others within small group settings where the same individuals are in regular contact with one another and participate in the same activities (Ahearn, 2001). For this reason, classrooms and other sites of formal education have been key sites for this type of research (e.g., see Arnold, 2010; Calabrese Barton and Tan, 2009, 2010; Brown, 2004; Kane, 2012; Moje et al., 2001; Oliveira, Akerson, & Oldfield, 2012; Siry, Ziegler, & Max, 2012).

For many scholars attending to the roles of agency, identity, and language in education, conflict seems to be a common theme, the source of which stems from identity incongruence for many minority students: a mismatch between who students think they *are* and who they think they must *be*, or *be like*, to succeed (or even survive) in school (Brickhouse et al., 2000; Brickhouse & Potter, 2001; Stanley & Brickhouse, 2001). Of the many

research agendas concerning Latina/o educational inequality, few are as crucial and as timely as those concerning Latina/o successes and failures in science.

2.8. Tracking Latinas/os in Science

Proportionally, Latinas/os do not experience similar levels of educational achievement and success in science, relative to any other ethnic or racial group. Latinas/os are underrepresented in both higher education science degree attainment and in the science workforce, accounting for only 5.8% of the United States science workforce—Latin*as* account for just 2.4% of the science workforce—despite representing the largest and fastest growing group within our national population at 16.9% (NSF, 2015). Similarly, of all science degrees awarded in 2012 (731,878 in total), only 9.7% of these degrees were awarded to Latinas/os; further still, Latina/o underrepresentation increases when correlated to degree type (Chapa & De La Rosa, 2006): associate's (14.7%); bachelor's (10.1%); master's (6.3%); doctoral (4.3%) (NSF, 2015), and at 15.1%, Latinas/os have the highest high school dropout rate of any minority group (NCES, 2012).What are we to make of these numbers?

When digesting statistics such as these, it is easy to become subsumed in the "crisis" narrative (McCarty, 2012), a political discourse that indeed acknowledges a problem, but tends to focus on how these figures can

be remedied within an existing power structure and system of accounting, for example, by increasing achievement scores and the like (Lee & Luykx, 2006; Tan & Calabrese Barton, 2008b). Irrespective of the misguided goals of the crisis narrative, we must not lose sight of the fact that these inequalities *do* exist and persist in our educational system (Valencia, 2002).

In addition to the numerous means by which Latinas/os remain systematically disadvantaged within the American education system, there exists another trend that helps to explain the underrepresentation of Latinas/os in science: tracking (Coley, 1999). The logic of tracking, as a critiqued yet still widely utilized practice within schools, assumes that intelligence is both inherent and relatively fixed, as the groups to which students are assigned are exceedingly difficult to change (e.g., switching from a low track to a high track)—especially as students progress through grade levels—because they are semi-permanent or permanent in the majority of cases (Oakes, 2005). Within each track, students are subjected to curricula tailored to the group's ability level—which is supposed to be fairly similar across students, although these determinations are often made on the basis of students' performances on standardized examinations—with lower tracks generally receiving basic courses and less rigorous instruction, while students in higher tracks gain exposure to more high-quality and stimulating instruction (Oakes, 2005).

Proponents of tracking argue that it increases educational efficiency and that every student benefits as a result, mainly because of the assumption that some students will feel inferior and unmotivated if they are grouped with students that learn more quickly than they do (thereby hindering their desire to participate), or conversely, that the high-achieving students would be "slowed down" by others that may need more time to grasp important concepts and material (Valencia, 1997, 2002). However, several studies have shown to support just the opposite regarding the assumptions under which tracking policies are implemented. When students of different ability levels are placed within the same learning environment and given the same instructional activities, the students presumed to be low-achievers often rise to the occasion by demonstrating a willingness to participate and learn material thought to be too challenging for them, while the high-achievers do not report feelings of boredom or having been slowed down when teachers need to spend extra time reviewing concepts and material they may already grasp (Oakes, 2005). To be sure, sometimes some students do need a little extra time and attention in order to comprehend material that their peers may already grasp; the key is to locate which particular activities certain students feel comfortable enough in succeeding, and perhaps exceeding the expectations that have been made about their ability level.

In addition, it is worth stating that a significant part of the logic behind tracking has little to do with the students at all; instead, grouping students of

the same ability level together is also thought to ease the facilitation and management of teaching duties (Oakes, 2005).

For Latinas/os, like for so many other students, tracking only seems to hinder opportunities for achieving academic success, and especially in science. Zuniga et al. (2005) found that schools often make decisions about science track placements based on language. In their words, “A primary reason to use language status as a criterion for placement is the assumption that students with lower proficiency in English will have more difficulty in academic subjects that are vocabulary-intensive—a rationale based on opinions of the school’s administrators about ability to achieve” (p. 393).

Given the privileged status of English in schools, it is unsurprising that many English-fluent White students are placed in higher tracks (which is often the case), while bilingual Latina/o students are placed in lower tracks. However, Zuniga et al. (2005) also report numerous instances of White students performing more poorly than Latina/o students on standardized English placement exams, and yet these White students still being placed in the higher tracks despite their lower achievement scores. This trend may be due in part to an implicit bias or prejudice (on the part of teachers and administrators ultimately responsible for implementing tracking assignments), informing their value-based judgment that White students *should* be in the high-achieving groups.

When Zuniga et al. (2005) evaluated the consequences of students' placements in one track or the other, they found that the students placed in the higher track received good grades, while not one of the students placed in the lower track improved in their academic performance. This is ironic, given that one of the implicit goals of tracking is to help *all* students achieve (albeit at a different pace), and not simply the ones that are placed in the higher tracks.

Science education scholars invested in educational equality maintain that the tracking of Latina/o students is neither an unrelated precursor to—nor a viable solution for closing—the achievement gap but rather part of its *cause* (Peng, Wright, & Hill, 1995). If Latinas/os are *under*represented in the higher tracks, it is *because* they are also *over*represented in the lower "special needs" tracks; a trend that unfortunately has been decades in the making, thereby also contributing to ongoing cycles of underachievement and impoverishment (Carter, 1970; Peng, Wright, and Hill, 1995; Valencia, 2002; Zuniga, et al., 2005).

In many ways, the tracking of Latinas/os in low-achieving science classes has the impact of a diabolical self-fulfilling prophecy: when students are *told* (through their placement in lower tracks) that they are neither as capable nor as smart as their peers in the higher tracks, it should not be surprising that these students' test scores remain low; they are not *expected* to succeed in the same ways that the students in high tracks are (Valencia,

2002). In this way, tracking may predetermine the comparatively lower levels of school science achievement among students placed in the low tracks (Carter, 1970; Zuniga, et al., 2005).

Tracking also has important implications for identity performance in schools: students are aware of the groups they are assigned to, and when placed in lower tracks by meaningful authority figures, such as their teachers, they recognize the evaluation that has been made of them in relation to their peers. Such recognition, exacerbated by accompanying lowered expectations, may then become embodied by students resulting in the acceptance of their positioning and the concordant presentation of an identity as a lower-achieving (e.g., perhaps even less smart) student that may then endure through, outside of, and even beyond one's educational tenure. Likewise, high track placement can have positively reinforcing consequences in both achievement (Haury & Milbourne, 1999) and identity.

In a similar fashion, Annegret Staiger (2004) in her examination of a gifted magnet program at an urban California high school notes the problem of labels within schools. In Staiger's work, she studied how voluntary *desegregation* within a school can actually function as a form of *resegregation*, revealing further insight into processes of racial identity formation within schools; and in this case specifically, the equation of "Whiteness as giftedness" (Staiger, 2004). Here, the connections with tracking are ample: the "schools-within-schools" (i.e., the group of mostly

White magnet students and the group of mostly minority non-magnet students) to which Staiger refers, exacerbate psychological damage and feelings of inferiority among the students placed outside of the magnet program (Staiger, 2004). While the fifth-grade students of Amblen are not segregated on the basis of race (being exclusively Latina/o), they are however segregated on the basis of their English language proficiency. Regardless of factors used to determine group placement, the very act of *dividing* students can engender damaging consequences.

Latina/o educational scholars have demonstrated that tracking is but another mechanism that functions in such a way to systematically disadvantage and disenfranchise Latinas/os by denying them access to rigorous and high-quality preparation necessary to succeed in school (Tate, 2001). Indeed, many have begun to think of tracking as form of neo-segregation, or "resegregation" (Valencia et al., 2002), noting the prevalence of Latinas/os' placements in remedial courses satisfying only basic requirements, courses which fail to adequately prepare one for college curricula, or even college admission. "More [Latina/o] students (50%) are enrolled in general programs of study than either Whites (39%) or [African Americans] (40%) [and] only 35% of Latina/o students are enrolled in college preparatory or academic programs, compared with 50% of Whites and 43% of [African Americans]" (Zuniga, et al., 2005, p. 380).

> The most urgent social issue affecting poor people and people of color is economic access. In today's world, economic access and full citizenship depend crucially on math and science literacy…the absence of [this] literacy in urban and rural communities throughout this country is an issue as urgent as the lack of registered Black voters in Mississippi was in 1961. (Moses & Cobb, 2001, p. 5)

As the fastest growing group within the United States population, with a projected estimate of almost one quarter of the national population by 2050, the continued underrepresentation of Latinas/os in science will result in the inability of Latinas/os to regularly attain positions of influence, power, and privilege in America (Chapa & De La Rosa, 2006).

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After having surveyed much of the scholarship concerning Latina/o educational experiences in the United States, and the critical ethnographies that have emerged as a result, I transition to a broader discussion of the importance of science education in America, as part of the diagnostic character of a country that entrusts the progression of science with its national security and welfare. In doing so, this chapter offers a critical political economy approach to deconstruct the role of the state and the associated assumptions, discourse, and ideologies that undergird the financing and regulating of education in the United States (Collins, 2009; Gradstein et al., 2004).

This chapter then goes on to deconstruct the mechanisms of epistemological reproduction both in and through science that occur within our schools, as they have very important implications, I argue, for the ways in which students come to perceive themselves as learners and doers of science. This chapter concludes by providing a conceptual framework to understand a particular form of identity (i.e., school science identity), in addition to a theoretical background for gender issues in science.

2.9. The Political Economy of Science Education and Citizenship

Given the enormous amounts of capital, energy, resources, and time channeled into financing and regulating education—it remains safe to assume that education is crucial for individual as well as social welfare (Gradstein et

al., 2004). Within education, science education is of particular importance: “A large portion of scientific research and education have historically resided in the public domain, neoliberal public sector reform holds profound implications for both” (Carter, 2008a, p. 620).

Provided the current worldwide distribution and transformation of capital, communications, goods, and ideas, all facilitated by science, it is not possible to fully appreciate the impacts of science education removed from this context (Charlton & Andras, 2006; Chiu & Duit, 2011; Franklin, 1995; Niens & Reilly, 2012; Tan & Calabrese Barton, 2008b; Van Eijck & Roth, 2011). Indeed, this follows because Western societies *are* techno-scientific societies (Gusterson, 1997; Latour, 2004), whereby science and its products (often thought of as technology) function not merely as a pillar of society (Merton, 1971), but rather, pervade *all* aspects of society whether visible or not (Sunder Rajan, 2006; Weinstein, 2004, 2008, 2012).

Science education in the United States is linked to neoliberal economic development strategies, promoted as a banner of progress, and recognized as a component of citizenship (Carter, 2005, 2008b; Bencze & Carter, 2011). Since the early 1950s, science education has been promoted in the United States, more so than any other school subject, for its contributions to national security and economic prosperity (Bianchini, 2013; NRC, 2011, 2012; Tan & Calabrese Barton, 2008b). Indeed, science education reform reflects the changing circumstances of the nation’s sociopolitical landscape, ever-striving

to bolster the nation's reputation and economic security within a globally competitive marketplace (Tate, 2001).

Perhaps the most well known example, highlighting science education reform efforts in the service of national security, takes us back to the height of the Space Race and Cold War tensions between the United States and the Soviet Union. At this time, and for the first time, science education became an explicit issue of national security in the United States; many perceived the welfare of the nation to depend upon the collective innovative and technological capabilities of its citizens (Rutherford, 1964). As a consequence, science classrooms were re-conceptualized as *the* training grounds for future scientists; quite literally, they were the sites of recruitment (DeBoer, 1991). Joseph Schwab—at the time, a member of the Biological Sciences Curriculum Study—pushed science education reform of the era to include "science as enquiry" (DeBoer, 1991). This effectively amended the science teacher's primary responsibility from being one of simply transmitting scientific content knowledge to students, to teaching students how to ask scientific questions, look for evidence, and evaluate experimental results, or in other words, how to think like scientists (Rutherford, 1964).

Hoping to incite greater passion and public support for science education and scientific research, science as enquiry represented Schwab's calculated effort to convince the American public that science is not simply an assortment of cold hard facts, but rather, as an exciting process of discovery

about the natural and physical world (Westbury, 2005). Schwab argued persuasively to his constituents engaged in science education reform that this orientation regarding new perceptions about the nature of science and science education would not only produce more future scientists—beginning in the classroom (i.e., students would come to think of science as exciting and fun, etc.)—but importantly, it would generate much greater public support for scientific research, two goals seen as vital to national security and "progress" (DeBoer, 1991).

Schwab's insistence on science as enquiry has left its mark on the American educational landscape, and in particular, on the science standards to which public primary and secondary schools are still held accountable (Westbury, 2005). Student interest and success (as defined by achievement scores) in science, more so that any other school subject, continue to be promoted within mainstream education policy circles for their potential to contribute to economic and national security in a globally competitive arena (Tate, 2001). While *what* to teach, and *how* to teach it, are still perennial topics of debate for American science education, just as they were for Joseph Schwab and his contemporaries, the much more pressing issue of today's science education is the issue of underrepresentation (Bianchini, 2013; Calabrese Barton et al., 2013; NRC, 2011, 2012; NSF, 2015).

Recognizing the persistent and pervasive underrepresentation of women and ethnic and racial minority groups, reform efforts of the late 1980s

explicitly advocated the necessity of “Science for All” (AAAS, 1989; Tan & Calabrese Barton, 2008b). “Science for All” still remains an unmet goal in the United States, especially for English Language Learners (ELLs), youth from low-income households, and underrepresented minority youth (NRC, 2012). While this equity-minded approach has indeed been welcomed by many, it also has been criticized on the grounds that the ethical problem of educational inequality, in and of itself, does not serve as the *primary* motivation for “Science for All”, rather, it is the familiar rhetoric of science education’s potential to contribute to the nation’s economic security and technological needs that continues to bolster its momentum (Tate, 2001).

From the perspective of the state, “Science for All”—or, that fact that underrepresentation exists in science—is a reminder of the failure to take full advantage of the human capital that would help spur economic growth and fortify our defense, security, and technology sectors. Indeed, these macro-level considerations do take the front seat in official publications concerning science standards and underrepresentation; consider the following two excerpts:

> (1) The education of the children of this nation is a vital national concern. The understanding of, and interest in, science and engineering that its citizens bring to bear in their personal and civic decision making is critical to good decisions about the nation’s future. The percentage of students who are motivated by their school and out-

> of-school experiences to pursue careers in these fields is currently too low for the nation's needs. (NRC, 2012, p. x)
>
> (2) The United States stands again at the *crossroads*: A national effort to sustain and strengthen S&E [science and engineering] must also include a strategy for ensuring that we draw on the minds and talents of all Americans, including minorities who are underrepresented in S&E and currently embody a vastly underused resource and a lost opportunity for meeting our nation's technology needs. (NRC, 2011, p. 2)

The language employed above by the National Research Council (2011, 2012) reduces human beings to "resources". Mainstream education policy is still primarily oriented toward remedying underrepresentation by closing the achievement gap, under the assumption that if underachieving students begin receive better grades and scores on standardized examinations, that ultimately, this will then translate into a greater number of individuals entering into the sciences both in higher education and/or in the workforce (O. Lee & Luykx, 2006).

While it may be easy to laud this endeavor as a step toward equality, the standardized testing instruments employed to evaluate students have historically benefitted dominant groups with access to capital and resources, and have excluded women and ethnic and racial minority groups, especially

Latinas/os (Collins, 2009; Karabel, 2005; Valencia, 2002). In this way, these standardized evaluation schemes play a role in *creating and maintaining* the achievement gap, because they homogenize the interpretation of learning outcomes and perpetuate the myth of schools as spaces of equal opportunity. In an educational climate where individuals, teachers, schools, school districts, states, and even the nation as a whole, are incentivized and pressured to produce superior test scores, *the* mission of education becomes one of precisely how to attain such scores, often at the expense of all other learning outcomes (Tate, 2001). Despite the "Science for All" discourse and corresponding curricular reform, inequalities in education persist and seem to mirror broader social inequalities, which the underrepresentation of Latinas/os suggests (Alemán, Jr & Alemán, 2010; Castagno, 2008).

2.10. Epistemological Reproduction in/through Science

While schools operate as sites of cultural and social reproduction, they are also sites of epistemological reproduction, and these processes of mutually inform one another. Students learn to position themselves in relation to others, and in relation to academic disciplines, as they participate in the social processes of schooling while developing epistemological stances towards these disciplines (Kane, 2012; Moje et al., 2001; Varelas et al., 2011).

As one comes to understand what science (or any other subject) is, how it is used, and for which purposes, one simultaneously develops an understanding of oneself in relation to this discipline and the community that engages it (Lave & Wenger, 1991; Vågan, 2011). Cultural, social, and political relations are embedded in the mediums (e.g., activities, assignments, experiments, textbooks, etc.) that transmit scientific content knowledge in schools (Haraway, 1988; Star, 1991; Traweek, 1988; Van Eijck & Roth, 2011; Weinstein, 1997, 2008). Through students' interactions with ideas, other students, teachers, textbooks, and the like, they not only acquire content knowledge, but more importantly, they come to formulate understandings of how to position themselves, and others, within broader sociocultural fabrics concerning the nature of this content and who is responsible for producing it (Kane, 2012; Moje et al., 2001; Varelas et al., 2011).

(2.10.1.) Challenging What Science Does

Robert Merton (1973) famously put forth the structural-functionalist view of science, whereby science operates in society as but one of several well-defined institutions (others include government, religion, etc.), and "The institutional goal of science is the extension of certified knowledge" (p. 270). An illustrative analogy here is to consider society to represent a tabletop, while an important institution such as science, represents one of the table's legs, supporting the tabletop by providing *structure* and helping it to *function*

as a whole, when joined by the other legs. Of course, this analogy implies that all institutions contribute equally to a society's structure and function, and that they all must be operating simultaneously for society to function properly. Merton's understanding of the function and structure of science is shaped by the set of norms he believed to be guiding scientific practice (Sismondo, 2004). These norms are perhaps better thought of as ideals, the first of which is *universalism*, which holds that scientific claims are evaluated on the basis of the scientific claim itself, and not on the attributes, characteristics, and/or traits of the person making the claim; in Merton's (1973) words, "Race, nationality, religion, class, and personal qualities are irrelevant [in evaluating scientific claims]" (p. 270).

Universalism depicts science as generally apolitical, conflict- and controversy-free, and as an objective investigative activity occurring within a vacuum, one that arrives at undeniable truth claims about the biophysical world (Latour, 2004; Richard & Bader, 2010). This assumption, however, obscures the political nature of science, rendering invisible persistent inequalities concerning *whose* truth counts the most, as well as *whose* truths are epistemologically credible (Jasanoff, 2005; Soto Laveaga, 2009). Perhaps the most glaring oversight of universalism is that it falls swift victim to the ethnocentric assumptions of naïve realism, or, "The almost universal belief that all people define the real world of objects, events, and living creatures in pretty much the same way" (Spradley, 2000, p. 21), a notion cultural

anthropologists have recognized as an egregious folly for over a century and counting.

Merton's (1973) second norm, *communalism*, posits that scientific knowledge is the property of the commons—an outcome of cumulative production—and once produced, may be used by anyone as the basis for generating additional scientific claims. Merton views science as functioning for the "common good", but this assertion raises an important question: what is "common" in this context, and, who is included within this designation? Nancy Fraser (1990), in her critique of Jürgen Habermas' "public sphere", argues that the phrase *common good* must be employed with caution because it obfuscates sociopolitical power dynamics, which render social hierarchies and inequalities invisible. In general, anything that is professed to be for the "common good" is usually the outcome of debate within the context of a social forum marked by inequalities of influence (Fraser, 1990, p. 130).

Merton's (1973) third norm, *disinterestedness*, posits that scientists conduct research—and report the results of their research—neutrally and objectively, free of any personal agenda, interests, and prejudice; this is supposed to operate as a safeguard against fraud (Sismondo, 2004, p. 21). Disinterestedness is particularly idealistic, especially given the explicit assumption that science is apolitical. On the contrary, science has *always* been a political activity (Bäckstrand, 2003; Dear & Jasanoff, 2010; Gieryn, 1995; Jasanoff, 1998, 2005, 2010a, 2010b, 2010c, 2011, 2012; Latour, 2004).

From climate change (Jasanoff, 2010c; Kolbert, 2006; Oreskes & Conway, 2010; Sayre, 2012), to the health effects of smoking cigarettes (Oreskes & Conway, 2010), to the patenting of DNA sequences (Jasanoff, 1998; Sunder Rajan, 2006), scientists and non-scientists alike have long engaged in high stakes scientific research programs, the results and dissemination of which have been largely dictated by non-scientists. It is not possible to segregate science, no matter how one chooses to define it, from the broader political spheres in which it operates (Bäckstrand 2003; Gieryn 1995; Jasanoff 2005, 2010c, 2011).

The last of Merton's (1973) norms, *organized skepticism*, is the notion that the scientific community will scrutinize new ideas and theories until they have been generally accepted through a preponderance of admissible and credible evidence. This, too, can be critiqued on the grounds that the process of defining something as "evidence" requires acts of interpretation, which are not wholly objective; more simply, what counts as evidence is not always evident. The same goes for scientific credibility: credibility is an outcome of contingent social and cultural practice (Shapin, 1995a, 1995b). Establishing the credibility of scientific claims about the biophysical world is predominantly a sociopolitical exercise, not a scientific one, and thus, scientific credibility cannot logically be taken as natural or inevitable (Jasanoff, 2005, 2010c, 2011).

On the whole, Merton's depiction of science is entirely too narrow and fraught with contradictions and inconsistencies (Becker, 1984; Crothers, 2009; Fuchs, 1993), not least of which is Merton's idealized portrayal of science as an investigative *activity* divorced from the political economy. As Lyn Carter (2008b) suggests:

> There has been a shift in the Mertonian values of scientific communalism, disinterestedness, the free flow of knowledge, and organized scepticism [*sic*] to ones based in the entrepreneurial spirit and economic growth, such that scientific intellectual creativity seems to have become synonymous with commodity. (p. 626)

Despite these issues, the Mertonian model of science (i.e., as an idealized investigative activity) persists in the American education system and remains a common view held by scientists and non-scientists alike (Jasanoff & Kim, 2009; Jasanoff, 2005; Jenkins, 2003; Rudolph, 2003; Shapin, 1995b; Sismondo, 2004). Importantly, this view is also well-reflected in the National Science Education Standards literature and implementation (NRC, 2012).

(2.10.2.) Challenging What Science <u>Is</u>

Much work considering the reproduction of scientific epistemology draws on the scholarship of Thomas Kuhn (Carter, 2008b; Phillips, 1995; Rouse, 2006; Weinstein, 1997). For Kuhn, "Science [i]s merely what scientists do" (Sismondo, 2004, p. 12). Among scientists of a certain discipline (e.g.,

biology, chemistry, physics, etc.), to share a paradigm is to share common beliefs about: important past accomplishments in the field; which theories one must subscribe to; the constitution of the important questions of the field; and, the methods appropriate for resolving these questions (Sismondo, 2004, p. 12). Paradigms operate here as a taken-for-granted worldviews, structures that guide scientific scrutiny and analytical interpretation. It is only once the theories, relevant questions, and/or methods for addressing these questions become problematic in their own right, (e.g., via the accumulation of statistical anomalies and/or observable inconsistencies through scientific research, etc.) that a paradigm enters of period of "crisis" (Kuhn, 1970). It is then that newer scientists entering the field—not quite wholly indoctrinated in the ways of the at-risk paradigm—developing alternative theories, methods, and questions. When the theories and views held by the scientists of the newly emerging paradigm fail to make sense within the context of the existing paradigm, the two become "incommensurable" (Kuhn, 1970). This process ultimately results in the replacement of one paradigm with another; Kuhn (1970) termed this a "revolution". In this way, each paradigm serves as its own meta-framework for making sense of the world, neither better nor worse—and certainly no more "true"—than the paradigm preceding it.

Understanding the production and reproduction of scientific knowledge in this way has important, but challenging, implementations for education (Carter, 2008a; Phillips, 1995; Weinstein, 1997). To educate one in the

sciences is to transmit the assumptions, content, and theories of the extant paradigm, and schools become the primary sites of indoctrination via pedagogy (Weinstein, 2008).

Since the days of Joseph Schwab, educators have been concerned with the most appropriate and/or effective way to teach science to our youth (DeBoer, 1991). In this mission to inculcate those in what science *is*, there indeed exists a spectrum from *telling* (e.g., these are the cold hard science facts, such as knowing the number of protons in an atom of oxygen, or the components of a cell, or the phases of the water cycle—all of which require rote memorization and the passive absorption of information) to *showing* (e.g., experiential learning through laboratory dissections or fieldtrips where students learn to role-play as field ecologists, for example, or newer Problem Based Learning [PBL] approaches in which students assume a more active role in the learning process by working in teams to pose viable solutions to real-world problems presented to them as case studies by their teachers [Carter, 2008a]).

Despite educators' and policymakers' best efforts to reform science education by offering a virtual cornucopia of alternatives to the static transmission of scientific facts in the classroom (Weinstein, 2012) (most recently culminating in the newest set of science standards proposed in the Common Core, which privileges analytical and critical thinking [CCSSI, 2014]), science education in America is still carried out as an exercise in

telling (Weinstein, 1997). This is undoubtedly the case for some students more so than others, as low-income students (many of whom are underrepresented minorities), who attend low-income schools situated in low-income neighborhoods, simply do not have the same number and types of opportunities (e.g., fieldtrips, lab equipment, etc.) available to them as do privileged students (Varelas, et al., 2011). This is also undoubtedly the case for the underprivileged students of Amblen that participated in this research, as their perceptions about what science *is* have been shaped by the mediums in which science has been transmitted to them; this discussion is detailed in Chapter Four (Central Findings).

The gap in educational experience can have important implications for how diverse groups of students come to understand what science *is*. Perhaps most commonly, from the perspective of students that have not been afforded the opportunities to participate in hands-on scientific investigation and/or inquiry, they may feel more disconnected from science, as it is something that happens *over there* (i.e., science as an activity that is performed by English-speaking middle-class White males), and only to be learned about *here* (i.e., in classrooms) (Weinstein, 2008). Bruno Latour's (1987) *Science in Action* presents a similar binary of "science in the making" versus "science ready-made": education (i.e., "ready-made") assumes a passive role in the transmission of scientific knowledge *in* schools, whereby the scientific

knowledge itself is continuously “in the making” within actor-networks *outside of* schools and classrooms.

Alternative models to this binary have been productive, especially in envisioning a more active role for education in the (re)production of scientific knowledge (Weinstein, 2008). Illuminating such connections requires that one begin to see science more than an investigative activity but as *culture* (Weinstein, 2008).

(2.10.3.) Science as Culture

Science is inextricably bound to daily life within the techno-scientific culture/s of modernity, configuring and reconfiguring interpretations of material realities, while mediating and shaping social relations (Latour, 2004; Richard & Bader, 2010). Because of this, it is not possible to map the boundaries of science (i.e., where it *begins* and where it *ends*), similarly as it is not possible to map the boundaries of culture; neither can be reduced to any enumeration of beliefs, norms, practices, or values, but each can be heuristic tools enabling processes of enculturation (Franklin, 1995; Noblit, 2013; Weinstein, 2004). Taking this perspective to heart, the implications for reconsidering the role of education in society, and science education in particular, are especially transformative.

When we begin to see science as more than an investigative activity but as *culture*, as Matthew Weinstein (2008) argues for, science education by

extension becomes not the process of introducing students to the canon of an empirically-based Western worldview, but rather, a process in which students are enculturated into the techno-scientific world shaped by Western modernity; schools and classrooms become the sites of enculturation (Kim, 2011; Parsons & Carlone, 2013). In Weinstein's (2008) own words:

> From the multiple ways students are sorted and selected, labeled, and tracked to the new microtechnologies that monitor academic progress, to the managerial sciences that structure the day, and to the architecture, which envelopes schooling, schools are woven pastiches of linguistic, material, cognitive, managerial, accounting, environmental, and metrological sciences. (p. 396)

In schools, students engage with science in a myriad of ways: they consume scientific content knowledge; get taken up in larger projects as the *objects* of scientific analyses (e.g., in the evaluations of schools and school districts from standardized test scores); and, come to embody scientific understandings of self (e.g., as numbers which chart progress through the process of schooling—even perceptions about what is "normal", originally a concept from the statistical sciences appropriated for everyday linguistic use to describe what is average, common, and even sought after [Slater, 1998]) (Claussen & Osborne, 2013).

Coming to understand science as culture is to see the consistent and persistent irony that students are simultaneously consumers, re/producers,

and objects of science; students learn classification schemes for organizing and making sense of the biophysical world, while they *too* are subjected to similar classification schemes and typologies (Weinstein, 2004, 2008).

For students, however, the experience of school science can largely be one of indoctrination: whether instructed by teachers to consume and memorize important scientific facts or otherwise told to conduct simple controlled experiments (i.e., practicing “science as enquiry”), the end result is usually the same: the reproduction of an epistemological understanding of science as an *inherently* credible investigative activity (Weinstein, 1997). In schools, any interpretations of science as culture are generally rendered invisible to students, and instead, teachers and textbooks depict science as conflict- and controversy-free (Latour, 2004; Richard & Bader, 2010). This is indeed the science education that the students of Amblen receive.

Given the ubiquity of curricula that present science as an apolitical rule-governed enterprise, it is tempting to interpret science education as timeless and passive; sites where scientific facts are simply *distributed* to students from educators (Weinstein 2008). Learning, however, is so much more than the passive transmission of knowledge from educator to pupil (DeBoer, 1991; Driver, Asoko, Leach, Mortimer, & Scott, 1994; Heberlein, 2012; Lave & Wenger, 1991; Nieto, 1999; Phillips, 1995; Richard & Bader, 2010).

Learning is not an individual cognitive act of knowledge *acquisition*; rather, learning is a social event, an active process of *becoming*, that is, becoming a legitimate participant within a particular "community of practice" (Lave & Wenger, 1991). Assuming otherwise misses a crucial opportunity to understand why—and the ways in which—diverse groups of students react to, incorporate, and challenge scientific knowledge in ways that help shape their conceptions of science and of self, simultaneously (Nieto, 1999; Shanahan, 2009; Syh-Jong, 2007; Vågan, 2011).

2.11. Identity, Gender, and Figured Worlds

(2.11.1.) Identity

Identities refer to one's understandings of self, but importantly, they cannot be conceived outside of the cultural and social relations that continually shape them (Bourdieu, 1994; Brickhouse & Potter, 2001). Identities are fluid and multiple (e.g. academic, disciplinary, discursive, ethnic, gendered, normative, personal, etc.) (Arnold, 2010; Brown, 2004; Kane, 2012; Tan & Calabrese Barton, 2008a; Shanahan & Nieswandt, 2011), and they are performed through one's self-presentations (e.g., actions, behavior, discursive practices, interactions, etc.). In other words, one's identity is not singular or static; identities are emergent representations of self—and while potentially enduring, or not—they are individually authored through one's agency yet

continually shaped by contextual and structural forces (Ahearn, 2001; Arnold, 2010; Calabrese Barton & Tan, 2010; Holland et al., 1998).

Individuals' understandings of self are hierarchically organized in different ways depending on the social contexts in which they emerge (Tan & Calabrese Barton, 2008b). For instance, one may think of oneself differently, and/or choose to present different aspects of self, as suited to reflect their in-the-moment perception of who they think they are—and who they believe they need to be—all guided by a particular sociocultural milieu (Burke & Stets, 2009; Cerulo, 1997; Côté & Levine, 2002; Holland et al., 1998; Lave & Wenger, 1991). Thus, identities are not the *solely* the attributes or creations of individuals, rather, they are co-constructed: while identities are individually authored through one's sense of agency, individuals always make sense of themselves *while* they are made sense of by others (Kane, 2012), which influences both one's presentations and understandings of self (Burke and Stets, 2009; Cerulo, 1997; Côté and Levine, 2002).

The turn toward identity scholarship in science education began to appear consistently by the mid-1990s (Shanahan, 2009), and occurred in the wake of the American Association for the Advancement of Science (AAAS) call for "Science for All" (1989). Identity research points toward understanding underrepresentation in the sciences less as a *competency* problem (i.e., an individual's cognitive, cultural, and/or linguistic "deficit"), and more as an issue of schools privileging particular presentations of self as more or less

"scientific" (Brickhouse & Potter, 2001; Brown, 2004; Calabrese Barton & Tan, 2010; Calabrese Barton et al., 2013; Carlone & Johnson, 2007; Johnson et al., 2011; Kane, 2012; Shanahan, 2009; Tan & Calabrese Barton, 2008a). Indeed, a good deal of research in this domain has found that minority students report experiencing greater difficulties, or disinterest, in "doing" school science because it can often mean hiding aspects of one's cultural, gendered, and/or ethnic understandings of self (Brickhouse et al., 2000; Brickhouse & Potter, 2001; Brown, 2004; Shanahan, 2009).

Typically, successful science students are individuals that think of themselves—or are perceived by others (e.g., family, friends, peers, teachers, etc.)—as being good at science, whom may want to understand the world scientifically, and whom present this valued understanding of self to others. Importantly, perceptions of who *are* as well as who *can be* competent and/or successful science students are influenced in part by what counts as "success" in the classroom (Carlone et al., 2011), as well as enduring and powerful cultural-historical models (i.e. stereotypes) (Calabrese Barton & Tan, 2010), which are reproduced in schools and in popular cultural representations of science and scientists—representations embedded in the mediums (e.g., activities, assignments, experiments, textbooks, etc.) that transmit scientific content knowledge in schools (Aikenhead, 2001; Chen, Chang, Lieu, Kao, Huang, & Lin, 2013; Christidou, Hatzinikita, & Samaras,

2010; Laubach, Crofford, & Marek, 2012; Losh, Wilke, & Pop, 2008; Ruiz-Mallén & Escalas, 2012; Walls, 2012).

In the sciences, the most globally recognizable cultural model is the hyper-articulate, “geeky”, middle-class, White male (Tan & Calabrese Barton, 2008b). While students may or may not aspire to this or to any other stereotypical cultural model, they may still draw on such models in ways that can either encourage or constrain the understandings and expectations of *themselves* as competent and/or successful science students (Atwater et al., 2013; Foley, 1991; Ross & Medin, 2005; Wortham, 2008). This is no trivial point considering the recent work by anthropologists of education and science education scholars, which suggests that science competency—or even liking science—and affiliating with it (i.e., regarding oneself to be a “science person”) are not one and the same (Archer et al., 2010).

Students may perform well on standardized tests and find science to be both fun and interesting, but still may not self-identify as a science person, and this seems to be especially true for girls and for underrepresented minority students (Archer et al., 2010; Carlone et al., 2011). Findings such as these challenge widely held meritocratic assumptions regarding the combination of one’s academic achievement, when coupled with a genuine affinity for scientific knowledge, as a reliable indicator of one’s potential inclination to become a scientist, and instead point to underlying power relations deeply embedded within, and reflective of, the American education

system (Aikenhead, 2001; Borrero, Yeh, Cruz, & Suda, 2012; Delgado-Gaitan, 1994; Holland & Eisenhart, 1990; Sloan, 2007; Urrieta, 2005).

To better understand underrepresentation and how to move beyond it, it is clear that we need to develop better understandings of the ways in which diverse groups of students locate meaningful and productive spaces for themselves in school science, as well as how the constraints to accessing these spaces manifest within schools (Arnold, 2010; Calabrese Barton et al., 2013; Calabrese Barton and Tan, 2009; Carter, 2010; DeJaeghere & McCleary, 2010; Delgado-Gaitan, 1992; Gutiérrez et al., 1999; Moje et al., 2004; Rahm, 2007; Tan and Calabrese Barton, 2008b; Villenas, 2001).

Schools and classrooms are important social spaces for understanding processes of youth identity performance, and following sociocultural perspectives on education, processes of identity development and learning are mutually constitutive; neither can be fully understood in isolation from the other (Lave & Wenger, 1991; Shanahan & Nieswandt, 2011; Vågan, 2011). As with identity, learning does not just occur *within* social spaces, it is continually *shaped by* them (Lave & Wenger, 1991).

(2.11.2.) Gender Issues/Inequality in Science

Just as ethnic/racial minorities are underrepresented in science, so too are women. Indeed, STEM participation has historically been a high-status privileged venue for White men (Holland & Eisenhart, 1990; Johnson et al.,

2011; Riegle-Crumb et al., 2011). Interestingly, while young women graduate at higher rates than do young men (across every ethnic/racial category), there are far fewer women graduating with STEM degrees than there are young men (again, across every ethnic/racial category) (Riegle-Crumb et al., 2011).

Riegle-Crumb et al. (2011) compiled data on the total number of college graduates holding university degrees in science from 1995 to 2004 across ethnic/racial groups, and then calculated the percentage of women holding these degrees relative to their male counterparts; their findings are presented in Figure 1.4. below:

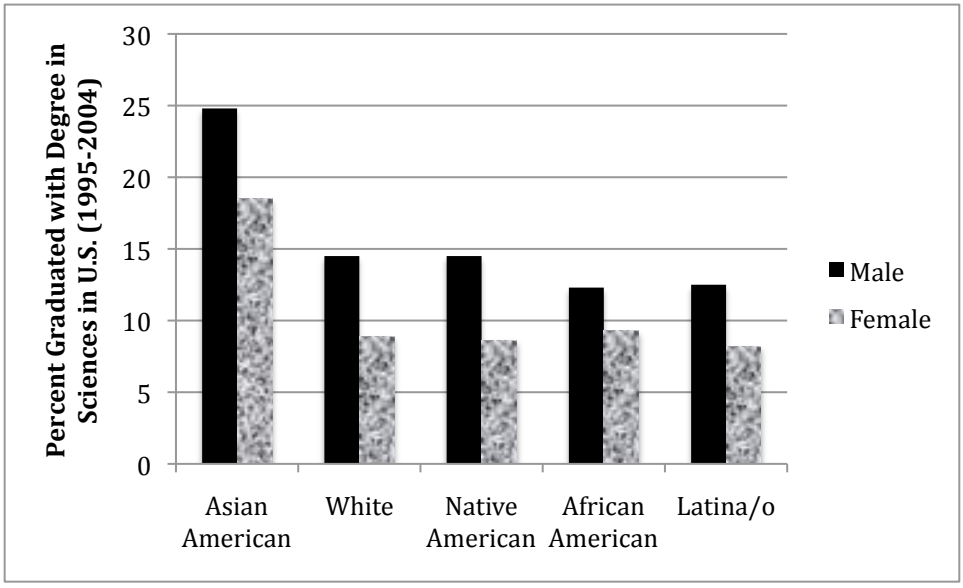

Figure 1.4. Undergraduate Degrees in Sciences by Gender and Race. (Source: Riegle-Crumb et al., 2011).

Similar patterns of gendered underrepresentation exist in the science workforce as well, with Latinas being the most underrepresented group, accounting for just 2.4% of the science workforce in the United States (NSF, 2015). Why do statistics such as these persist, despite countless efforts, reports, and research into increasing the proportion of girls and women in science? Part of the answer to this undoubtedly multidimensional question lies in what is happening in schools.

Content knowledge is only *part* of what schools and classrooms reproduce: these spaces actively reproduce class, race, and gender relations as well (Bourdieu & Passerson, 1977; Collins, 2009, 2013). Critical feminist scholars (e.g., Haraway, 1988; Holland & Eisenhart, 1990; Star, 1991) have put forth some convincing work regarding the mechanisms of the reproduction of gender inequality and its intersections within education.

Donna Haraway (1988) and Susan Leigh Star (1991), for example, offer discursive critiques of the active/passive distinction between science and science education, respectively, on the grounds of the gendered metaphors embedded within them. One's participation in science education not only indoctrinates one into scientific epistemology, but through one's participation—an enculturation of sorts—one comes to embody and reproduce the hierarchical social positioning of gendered and racial typologies (Haraway, 1989; Traweek, 1988). As Matthew Weinstein (2008) argues, "It is not hard to read this [active/passive binary] as a binary that simultaneously

constructs science as masculine, education as feminine, and then represses that femininity" (p. 391), as "doing science" is and has been stereotypically regarded as a male activity (Archer et al., 2010; Siry et al., 2012; Varelas et al., 2011).

Not only do schools operate as sites for the reproduction of gender inequality, they do so at every level from elementary school through college. Dorothy Holland and Margaret A. Eisenhart (1990), in their groundbreaking multiyear ethnographic study of 23 ambitious young women entering college (at two separate universities), posed the following question: Why do so many motivated young women enter college with firm goals and great expectations, only to leave with significantly lessened ambitions? The answer, they assert, is to be found within the culture and system of social rewards of the peer group (Holland & Eisenhart, 1990).

Much in the same way that school organization and structure reproduce class-based and race-based inequalities, it is largely the *peer group* structure and dynamics within the school that reproduces gender inequalities (Holland & Eisenhart, 1990). Or in other words, if school administrators and authority figures are culpable for perpetuating class- and race-based inequalities, it remains the students' very own classmates that reproduce gender inequality (Holland & Eisenhart, 1990).

In patriarchal societies, where male privilege permeates all arenas of cultural and social life, college becomes a venue when/where women truly

begin to “Enter into positions of economic and emotional dependency on men” (Holland & Eisenhart, 1990, p. 6). This dependency is all heavily facilitated and mediated by a “culture of romance” and a peer group system that distributes social rewards unevenly: while young men acquire prestige through a myriad of outlets, including academics and athletics; young women, on the other hand, receive far less social recognition for their academic and athletic accomplishments, and instead, become compelled to compete for prestige through their attractiveness to men (Holland & Eisenhart, 1990). This has tremendous implications for academic achievement.

In peer group systems that distribute social rewards unevenly between men and women, ones where women are valued for their attractiveness, there are powerful incentives at work for women to invest equally, if not more, in their physical appearances than in academic achievements. In the social world of the college campus, perpetuated by male dominance and privilege, women continue to learn that they will garner more attention from their peers, and receive compliments, for being *pretty* rather than for being *smart*. Some of the most compelling work being done regarding factors that explain gender inequality in education, especially in science, indeed focuses on identity.

While the preceding work focused on college-aged women, there is mounting evidence to support that girls, as early as elementary school, learn to present identities that emphasize physical appearance over intellectual aptitude. Archer et al. (2010) capture 10/11-year-old youth’s perceptions of

science and scientists (e.g., who can *do* science, who can *be* scientists, etc.), and importantly, how these perceptions differ between girls and boys. One young girl said the following when asked if she could see herself as a scientist:

> I wouldn't want to be a scientist because I don't want to find these like dead bodies and bones and . . . ugh! And then I wouldn't like to have big grey frizzy hair . . . because all scientists seem to have these caps on like bald heads and they have like [inaudible] and I don't want to look like that, I want to look beautiful. (Archer et al., 2010, p. 633)

What is most interesting here is not so much that this young girl does not affiliate with science as an appropriate profession, but rather, *why* she feels this way. The young girls interviewed in this study, similar to other studies conducted in a similar vein (Carlone et al., 2011; Riegle-Crumb et al., 2011), have learned to desire and express physical attractiveness as part of an authentic feminine identity; and popular perceptions of who scientists *are*, and what they *look like*, are thought to be incompatible with this authentic feminine identity. The young boys interviewed in this study also recapitulate the views held by girls:

> Boy 1: [I] don't think girls would make good scientists or like you know inventors and that, because they aren't usually interested in science mostly. If a girl is yeah, they would become famous like . . . there might be a girl that invented something– is there?

Int: Mm.

Boy 2: Yeah yeah. They mostly care about fashion. If they put everything into it, but most girls these days care about fashion and their trousers

Int: Couldn't [girls] care about fashion and science?

Boy 2: No they wouldn't, because fashion and science don't mix.

Boy 3: Your nails could get chipped.

Boy 1: I can add to that. Yeah, if they like . . . in science . . .cos most scientists wear glasses and girls these days care about fashion, and glasses aren't in fashion. (Archer et al., 2011, p. 635)

What this work points to is the importance of identity in science education, and namely for women, the importance of being able to claim and perform their individual gendered and disciplinary (e.g., scientific) identities, simultaneously, as both acceptable and appropriate (Calabrese Barton et al., 2013; Johnson et al., 2011; Riegle-Crumb et al., 2011; Tan & Calabrese Barton, 2008a). For many girls and young women sharing a genuine interest and proclivity for school science, they feel as though they must choose between investing in a scientific identity *or* a gendered identity, often with one being developed at the expense of the other (Calabrese Barton et al., 2013; Johnson et al., 2011; Riegle-Crumb et al., 2011). This may shed light on the widespread pattern of why so many girls and young women claim to lose interest in science between the ages of 10 to 14 (Archer et al., 2010;

Calabrese Barton et al., 2013), despite reporting great interest in science in the years immediately preceding this marked shift in preference. For boys and young men, on the other hand, being scientific is popularly, and stereotypically, perceived as a part of the male domain (Archer et al., 2010; Siry et al., 2012; Varelas et al., 2011).

All identities, including one's gendered identity, are fostered and shaped by the interconnecting sociocultural contexts in which they operate. Analytically, I understand these contexts as "figured worlds" (Holland et al., 1998).

(2.11.3.) Figured Worlds

Understanding learning as a socioculturally mediated act of community participation, Dorothy Holland et al. (1998) "figured worlds" framework is helpful in accounting for the power relations that constrain and facilitate participation within communities (Vågan, 2011). The figured worlds framework is one that can be applied to make sense of how individuals develop understandings of self in different cultural contexts or frames of meaning (Vågan, 2011). As Holland et al. (1998) put it:

> [Figured worlds are] socially and culturally constructed realm[s] of interpretation in which particular characters and actors are recognized, significance is assigned to certain acts, and particular outcomes are

> valued over others…[figured] worlds are sociohistoric, contrived interpretations or imaginations that mediate behavior. (p. 52)

Human beings are *acting* beings (Vygotsky, 1978), and our actions and practices carry meanings that are always situated within at least one, but often multiple, cultural contexts; it is not possible to divorce these actions and practices—theoretically, methodologically, or otherwise—from the cultural contexts that inform them (Wortham, 2008). In other words, there is no such thing as the isolated and unadulterated self, but always, selves *in context/s* (Cerulo, 1997; Goffman, 1959; Ochs & Capps, 1996). Holland et al. (1998) take this notion seriously, and it serves as the basis for their theory about the relationship between agency, culture, and identity within figured worlds.

School science may be thought of as a figured world, and when conceptualized as such, it serves as a model for understanding the structure or social space that shapes agency, identity, and participation in school and classroom activities (Hatt, 2011; Tan & Calabrese Barton, 2008a, 2008b; Vågan, 2011). I argue, as several others have successfully (e.g., see Hatt, 2011; Rahm, 2007; Tan & Calabrese Barton, 2008a, 2008b; Vågan, 2011), that the figured worlds framework is especially generative for making sense of identity within educational contexts.

Building on the contributions of activity theory (Vygotsky, 1978), practice theory (Bourdieu, 1977, 1990), Mikhail M. Bakhtin's (1990) "space of authoring" , and from their own personal insights from ethnographic fieldwork,

Holland et al. (1998) figured worlds framework considers not simply the development of identities, but rather, *identities in practice*. These "practiced identities" manifest within four components of activity, the first of which are the figured worlds themselves. Figured worlds operate as "frames of meaning" in which all actions are interpreted with reference to the communally negotiated meanings within the figured world:

> Thinking, speaking, gesturing, [and] cultural exchange are forms of social as well as cultural work. When we do these things we not only send messages (to ourselves and to others) but also place "ourselves" in social fields, in degrees of relation to—affiliation with, opposition to, and distance from—identifiable others. (Holland et al., 1998, p. 271)

The second component of identities in practice is *positionality*, or simply, an outcome of "being figured" by and within a figured world (Holland et al., 1998). Positionality has to do with one's status, as mediated by the power relations within figured worlds, and as such, impacts one's entitlement to cultural, social, and material resources (i.e., forms of capital) (Calabrese Barton & Tan, 2010; Maton, 2005; Power, 2011; Shanahan & Nieswandt, 2011; Shanahan, 2009; Vågan, 2011). Enduring social positions (e.g., class, ethnicity, gender, race, etc.) pervade *all* spheres of social activity, and thus, are pervading features of figured worlds as well (Hatt, 2011).

The third component of identities in practice is the *space of authoring*. In Holland et al. (1998) explanation, "Authorship is a matter of orchestration:

of arranging the identifiable social discourses/practices that are one's resources in order to craft a response in a time and space defined by others' standpoints in activity" (p. 272). One's space of authoring develops from one's sense of agency—it involves creativity, or improvisation—but, it is not to be equated with complete free will, for doing so would be to neglect that agency itself is socioculturally mediated (Ahearn, 2001).

The role of language is also important in understanding identities; we interpret our social worlds and give them meaning *through* language, and in this way, we are continually "authoring the world" (Bakhtin, 1990). However, the words we choose to use—and the meanings attached to them—are not our own, but rather the property of the social collective and of the histories that have come to shape them; words are always partly imbued with other's intentions (Bakhtin, 1990).

According to Bakhtin's (1990) reading, the social use of language, coupled with one's *own* intentionality, produces one's "voice". Yet,

> One's voice never becomes the "I," as even our own intentions and purposes reflect…the simultaneity of different languages and their associated values, [which] guarantees that the process of authoring is a complex act of choosing from multiple, sometimes conflicting and even contradictory perspectives. (Monzó & Rueda, 2009, p. 24)

Much in the same way that language mediates our experience in authoring the world, it also mediates identity, or authoring the self, which necessarily

entails a sense of understanding one's self from the perspective of others (Bakhtin, 1990). Indeed, "Speakers select genres of discourse with the knowledge (tacit or implicit) that others will interpret their discourse as an artifact of their cultural membership" (Brown, 2004, p. 813).

The fourth and final component of identities in practice is one's contribution toward *making worlds*, that is, figured worlds. Often, one's actions and practices may ultimately serve to reproduce the habitus (Bourdieu, 1994) of figured worlds in which they operate; however, new figured worlds may also emerge through a collective's "New "imaginaries" [that] build in their rehearsal a structural disposition…that comes to imbue the cultural media, [and] the means of expression, that are their legacy" (Holland et al., 1998, pp. 272–273). Making sense of individual outcomes in science education also requires an evaluation of how figured worlds (Holland et al., 1998)—in which individuals, their practices, and their interpretations of self and others, are embedded and given meaning—coproduce these outcomes (Arnold, 2010).

Investigating the embodied and performed aspects of one's school science identity, both theoretically and methodologically, demands an accounting of the normative practices of the figured world of school science (Hatt, 2011). As Gregory J. Kelly says, normative practices are "Patterned set of actions, typically performed by members of a group based on common

purposes and expectations, with shared cultural values, tools, and meanings'' (as cited in Carlone et al., 2011).

In school science, the normative practices of science classrooms, and the locally produced meanings associated with them—while different from classroom to classroom, yet similar enough to be considered credible and legitimate—are shaped by powerful structural forces concerning the epistemological nature of science (Walls, 2012) as well as enduring sociocultural models of competent and/or successful science students (Eisenhart & Finkel, 1998; Holland & Eisenhart, 1990) argued in the previous sections of this chapter.

Within figured worlds, individuals' actions reproduce the normative practices of the social space (Burke & Stets, 2009; Stryker, 2002), while "cultural capital" (Bourdieu, 1993) is assigned to particular practices and outcomes, thereby positioning individuals hierarchically within the figured world (Holland et al., 1998). In schools, *intelligence* can be thought of as a form of cultural capital (Gresalfi et al., 2009); it is socioculturally constructed—not the static attribute of an individual—and one's ability to take up a successful school science identity may rely on interpretations of one's intelligence (Hatt, 2011). In this way, "One cannot pull off being a particular kind of person (enacting a particular identity) unless one makes visible to (*performs* for) others one's *competence* in relevant practices, and, in

response, others *recognize* one's performance as credible" (Carlone & Johnson, 2007, p. 1190).

Pervasive social categories such as class, ethnicity, gender, race—or even one's ability to speak English well, such as is important for the students at Amblen—retain meanings that can cut across figured worlds and serve as [stereotyped] markers of ability, which can unequally position individuals within school science, including access—or lack thereof—to opportunities to participate both meaningfully and productively (Fordham, 1993; Holland & Eisenhart, 1990; Holland et al., 1998; Lei, 2003).

Students negotiate membership within school and classroom communities, with varying degrees of success, by constructing identities of who they understand themselves to be, who they *want* to be, and who they think they *need* to be within these spaces (Brickhouse et al., 2000; Brickhouse & Potter, 2001; Carlone et al., 2011; Kane, 2012; Stanley & Brickhouse, 2001; Varelas et al., 2011). However, students are not free to be whomever they wish; their abilities to author identities are facilitated by the patterns of expectations, meanings, and values of the figured worlds in which they operate (Carlone et al., 2011; Kane, 2012; Shanahan, 2009; Shanahan & Nieswandt, 2011; Varelas et al., 2011). Students come to understand themselves in relation to their peers, and become recognized by their peers, as particular kinds of people who are—or are not, to certain degrees—willing and/or capable of being successful in school (Carlone & Johnson, 2007).

Understanding how youth are able to claim and perform successful school science identities necessitates mapping the contours of the figured worlds of school science, including how students position themselves, and get positioned, within them. In this way, “science people” are not *born*, quite literally, they are *made*.

3. CHAPTER THREE: Research Design and Methods

3.1. Introduction

This chapter provides a detailed overview of my research design as well as the primary research methods used to collect the data that have helped to produce this dissertation. In what follows, I describe and provide justification for my research design by explicitly connecting my primary research methods as a means of answering my central research questions. I also make the case for the importance of taking an anthropological approach to addressing a research agenda such as the one I have set out to complete. Similarly, I also make the case for the importance of the ethnographic descriptions I provide as a means of both grounding and contextualizing my central research findings.

I then provide justification for my research site selection (conceived both broadly [i.e., Santa Barbara County (SBC)] as well as specifically [i.e., Amblen Elementary School]), sampling strategy, and informant selection. I explain the importance of maintaining the confidentiality, privacy, and safety of all research participants, and describe the process of the recruitment of research subjects as well as the process of obtaining informed consent. I then provide rich descriptions of the students and the teachers of the fifth grade.

I go on to describe and provide justification for the types and sources of data collected throughout this research enterprise. These data sources

include: Daily participant observation in both classrooms, accompanied by the composition of detailed ethnographic fieldnotes; two separate interview protocols ("Being a Science Student" and "Draw a Science Person"); drawing exercises (i.e., students were asked to individually draw a scientist, a science teacher, a science professional or someone who regularly uses science in their job, and a college science student); as well as free-list and rank-order exercises (i.e., students were asked to individually free-list and then later rank-order as many expectations placed upon "good" science students as they could think of).

Throughout the process of data collection, I approached each classroom as its own ethnographic case study, and I provide my rationale for doing so in this chapter. Finally, this chapter walks the reader through my analytical approach, that is, what it means to employ a constructivist grounded theory approach (Charmaz 2000, 2002, 2006; Grbich, 2007) in making sense of my analytical outcomes as I have (Denzin & Lincoln, 2003)

3.2. Research Design Connected to Central Research Questions

I designed my research methodology and sources of data collection in such a way to specifically address each of my central research questions. Below in Table 1.4., I link each of my primary research methods to the respective central research question/s it addresses.

In what ways do the division of students into groups (based on academic ability (i.e., English language proficiency) and behavior) impact…

(a) …the number and types of opportunities for Latinas/os to succeed in school science?

(b) …how Latinas/os negotiate the concept of 'success' in school science?

(c) …the ways in which Latinas/os claim and perform successful school science identities?

Table 1.4. Primary Research Methods.

Research Methods	***CRQ (a)**	****CRQ (b)**	*****CRQ (c)**
Participant Observation	+	+	+
"Being a Science Student" Interview	+	+	+
"Being a 'Good' Science Student" Free-lists		+	+
"Being a 'Good' Science Student" Rank-orderings		+	+
"Draw a Science Person" (DASP) Interview			+
(DASP) Drawings			+

Note: These primary research methods, and the data they produced, have been linked to the corresponding central research questions they help to inform.
* Central Research Question (a)
** Central Research Question (b)
*** Central Research Question (c)
(Source: Grayson Ford Maas Dissertation Research, 2015).

Table 1.5. Research Schedule.

Phase: / ***Month:**	**1** *A*	*S*	*O*	**2** *N*	*D*	*J*	*F*	**3** *M*	*A*	*M*	*J*
Participant Observation; Ethnographic Fieldnotes											
Interviews ("Being a Science Student")											
Interviews ("Draw a Science Person")											
Free-lists & Rank-orderings ("Being a 'Good' Science Student")											

*Note: Each one of the cells in the top row containing a single letter corresponds to a different month (i.e., August 2013 through June 2014).
(Source: Grayson Ford Maas Dissertation Research, 2015).

The logic of my research design will be best understood when considering the following explanation in combination with the information detailed in both Table 1.4. and Table 1.5. above. To properly answer my central research questions, I decided to divide my fieldwork into three phases.

The first phase (P_1) consisted exclusively of participant observation (discussed in much greater detail below) and the corresponding composition of detailed ethnographic fieldnotes. Participant observation was intentionally chosen to be the sole method for data collection during (P_1), when my central focus was twofold: One, to better understand the sociocultural worlds of each classroom, the school, as well as the students, teacher, administrators, and various other actors within them; and two, to guide and shape appropriate interview protocols for phase two (P_2) and phase three (P_3). While important for these reasons during (P_1), I employed participant observation throughout

the entirety of my research as it helped to address all three central research questions both directly as well as contextually. By continually observing, participating in, recording, and then reflecting on the various happenings of the fifth grade, I was able to better understand the differing ways in which students' classroom placement impacted the number and types of opportunities for them to achieve success in school science, how they negotiated what "success" means in school, and how they were able to claim are perform successful school science identities. Much more detail regarding my particular approach to participant observation will be provided in the Primary Research Methods section below.

Over the course of both (P_2) and (P_3), after having garnered the appropriate contextualization and grounding afforded to me by several months of strict participant observation, I was able to successfully draft and carryout two interview protocols, "Being a Science Student" and "Draw a Science Person" (DASP). The logic of administering each interview protocol will be addressed in turn.

The primary purpose of the "Being a Science Student" interviews was to understand the school science experiences from the perspective of individual students, as well as the ways in which students understand constructs such as "intelligence" and "success" differently across both classrooms (Hatt, 2011). These interviews also gauged the extent to which students understand themselves and their classmates as competent and/or

successful science students, in addition to their perception of the differences, if any, between the two classrooms. Thus, the questions asked of students throughout these interviews provided data that, once analyzed, was able to provide partial answers to each of the three central research questions.

During the (DASP) interviews, I asked each student to individually draw a scientist, a science teacher, a science professional (i.e., someone that regularly uses science in their job), and a college science student. I then asked each student, separately and individually, a series of open-ended questions about each of their drawings. The primary purpose of the (DASP) interviews was to determine the extent to which there exists differences in the degrees of similarity or discord in students' perceptions of—and feelings of affiliation with—"science people" (e.g., scientists, science teachers, science professionals, and college science students) between classrooms. Thus, these methods were administered expressly with the goal of helping to answer central research question (c), that is, how classroom placement impacts students' abilities to claim are perform successful school science identities. Much more detail regarding my particular approach to both interview protocols will be provided in the Primary Research Methods section below.

Finally, During (P_2) and (P_3), after students had enough exposure to, and participation in, the norms and practices of their respective classrooms—and after I garnered the appropriate contextualization and grounding afforded

to me by several months of strict participant observation—I asked students to individually produce free-lists (Ross & Medin, 2005; Ryan, Nolan, & Yoder, 2000; Thompson & Juan, 2006), in other words, to individually record as many expectations of "good" science students as they could think of (Bernard, 2011).

I expected the free-lists generated by the students to reveal central themes (Ryan & Bernard, 2003; Miles & Huberman, 1994) regarding students' shared understandings of who they think they must be, or be like, in order to succeed in school science (Brickhouse & Potter, 2001). Thus, these free-lists were administered expressly with the goal of helping to answer central research question (c), that is, how classroom placement impacts students' abilities to claim are perform successful school science identities.

After I compiled each of the students' free-lists, I selected a set of responses from their collective lists (i.e., those that were cited with the greatest frequency), and then instructed students to individually rank-order the items from most important to least important, in terms of the important expectations of "good" science students. The primary purpose of the rank-order exercises was to generate evidence that directly spoke to central research question (b), that is, how students' negotiate the concept of "success" in school science. Overall, I anticipated that while there would be considerable overlaps, what it means to be a good science student—and the expectations of them—would be qualitatively and quantitatively different

between the two classrooms. Much more detail regarding my particular approach to both the free-list and rank-order exercises will be provided in the Primary Research Methods section below.

My approach to data analysis rounds out the final component of my research design. To help establish case-based comparisons—as the articulation of my central research questions warranted—I employed a constructivist grounded theory approach to analyze the data collected throughout the course of the research enterprise (Charmaz, 2000, 2002, 2006; Emerson et al., 2011).

Due to the iterative nature of a constructivist grounded theory approach, the processes of data collection were quite inseparable from those of data analysis, and indeed both occurred in concert throughout the course of the research (Bernard & Ryan, 2010; Emerson et al., 2011; Taber, 2000). Recognizing that analysis pervades *all* phases of research, my approach to data analysis was inherently inductive as well as deductive (Emerson et al., 2011).

Indeed, such an approach was not only most appropriate, given the text-heavy nature of my primary data sources, but importantly, it complimented my theoretical framework for making sense of individual and group experience/s, as well as the nature of individuals' identity claims and performances: Identities are *co*-constructed in that students understand themselves, while they are being understood by others—and in turn students

then present these understandings of self—differently within particular social spaces (Kane, 2012). This is indeed the case because my own understanding of students' identity claims and performances must also be co-constructed; it is an intersubjective interpretive engagement created through the interactions between my informants and I (Bernard, 2011; Charmaz, 2006; Emerson et al., 2011; Grbich, 2007; Kane, 2012).

Additionally, a constructivist grounded theory approach was well suited to the idiosyncrasies and nuances that pervaded the students' lived experiences; it was necessary to fully capture the ways in which students navigated the school's, and their classroom's, institutional and social landscapes. I captured these moments by highlighting students' perspectives, thereby giving voice to them throughout the presentation of data (Borrero et al., 2012; Collins, 2013; Quiroz, 2001) in the following chapter, Chapter Four (Central Findings).

3.3. The Importance of an Anthropological Approach

The research agenda that I set out to take—of which my central research questions are a cogent and well-formulated extension—necessitated an anthropological approach. This approach required empathy, patience, and persistence, all in an effort to gain a deep understanding of the sociocultural world of the fifth grade, as experienced by the students with whom I spent so much of my time. This deep understanding, in turn, allowed me to produce

this ethnography—a “thick description” (Geertz, 1973) of the students, their teachers, and the sociocultural worlds they traversed. Producing such an ethnography, by employing an anthropological approach, required four mutually reinforcing components: Participant observation, emic perspective, holism, and cultural relativism.

Participant observation, discussed in much greater detail below, is the hallmark research method of cultural anthropology (Bernard, 2011; Nanda & Warms, 2012). It is a methodological orientation that entails honing the dual perspective of both detached spectator and engaged contributor, simultaneously. Participant observation, for me, required full and total immersion within the sociocultural world of the fifth grade; this method required that I not only gain access to this world, but that I gain rapport with all those operating within it (Young Jr., 2004). In order to truly understand—and not simply glean a superficial understanding of—the differing ways in which students’ classroom placement impacted the number and types of opportunities for them to achieve success in school science, how they negotiate what “success” means, and how they are able to claim are perform successful school science identities, I needed to employ participant observation to achieve an emic perspective.

An emic perspective is one whereby one learns to see, understand, and assign meaning to the world through the lens of those other than oneself (Nanda & Warms, 2012). As an anthropologist, this meant pushing aside my

own outside theoretical and analytical perspective to make room for perspective as a cultural insider, that is, to see the world as a fifth-grade student. For answering my central research questions, this shift in perspective was absolutely crucial; how else, for example, could I truly understand what school “success” means to a 10-year-old without going through the exercise of adopting a 10-year-old frame of reference?

An anthropological perspective also dictates that one approach any topic of investigation within the context of a holistic approach. Holism, for me, meant understanding that the answers to the questions I posed could not be *fully* answered without taking the time to investigate all of the complimentary factors that contribute to the creation and reproduction of the sociocultural world of the fifth grade classrooms as the principal social arena wherein the answers to my questions were found. These complimentary factors include, but are certainly not limited to: The social lives of the fifth-grade students outside of the classrooms, the decisions and responsibilities of the school teachers and administrators, the demographic factors of the school and the communities that surround it, and the bureaucratic and political climate shaping educational policy within SBUSD and California writ large, to name just a few.

Finally, anthropology taught me to maintain cultural relativism throughout my time in the fifth grade. As one of the core tenants of cultural anthropology, cultural relativism teaches us that if we genuinely wish to

understand *any* cultural space—as I wished to understand the cultural space of the fifth grade—that we must do so from the perspective of the cultural insiders inhabiting that space and from the histories that have shaped their systems of meanings, symbols, and values (Nanda & Warms, 2012). Cultural relativism goes hand-in-hand with the adoption of an emic perspective, and I maintained both for the duration of my time back in the fifth grade.

The sum total of the most important elements of the cultural anthropological toolkit—participant observation, emic perspective, holism, and cultural relativism—lend toward the generation not simply of superficial and decontextualized research findings, but rather, of a deep, rich, and context-dependent ethnography. Indeed, this ethnographic approach as a "thick description" (Geertz, 1973) of the fifth-grade students, and the sociocultural worlds they traversed while in school, was the *only* approach I could have taken to properly answer my central research questions. The answers to these questions could not be gleaned from spending several hours, days, or even weeks in school; instead, the answers to these questions only *began* to emerge after months of careful observation, reflection, patience, and continual hard work. Thus, the answers to these questions cannot be articulated in terse straightforward statements, rather, they unfold as part of the story I tell in the remainder of this dissertation.

3.4. Site Selection, Sampling Strategy, and Informant Selection

My site selection, sampling strategy, and informant selection have all been informed by my central research questions, and in what follows, I provide their justification separately and in turn.

(3.4.1.) Site Selection

Within Santa Barbara County (SBC) the city of Santa Barbara claims one of county's four High Poverty Areas (HPAs)—in which the majority of the individuals are Latina/o—wherein only 61.8% percent of its residents have attained a high school diploma or GED, which is 21 percentage points lower than the California state average (ICCED, 2013). Additionally, only one in every six adults within a HPA has completed a BA degree, while one in every three has done so statewide (ICCED, 2013).

SBC contains a total of 20 K-12 school districts (120 schools), with an enrollment total of 67,686 students, and within these schools, Latinas/os comprise just over two-thirds of the total student population, compared to 53.3% statewide (CDE, 2014). Within SBC public schools, 63.7% of its students are deemed "socioeconomically disadvantaged", 86.6% of whom are Latina/o, which is considerably higher than the state average at 70.8% (CDE, 2014). Within the 20 SBC school districts, Santa Barbara Unified School District (SBUSD) is the second largest, with a total enrollment of 15,518 students, or, 22.9% of the county's student population (CDE, 2014). Almost

60% of the students in SBUSD schools are Latina/o, 77.2% of whom are disadvantaged (CDE, 2014). Latinas/os also claim the county's lowest graduation rate (80.7%) and the highest dropout rate (13.5%) of all ethnic/racial groups, including the lowest percentage of high school graduates enrolled in postsecondary universities at 66% (CDE, 2014).

The large gaps in socioeconomic status, characteristic of the SBC region, is also well reflected within SBC's public schools, Latina/o students are *more* disadvantaged than they are at the state level, while white students are *less* disadvantaged than they are at the state level. This is potentially debilitating, as wedded to cycles of poverty—and marked by indicators such as income inequality—are one's levels of educational attainment. Significantly, there is a very strong relationship between parents' educational attainment and their children's academic success, especially when children are younger, which can easily translate into greater or lesser chances for positive outcomes later on in life, including but not limited to the attainment of college and/or graduate degrees which are strongly correlated to higher earning potential (Palmer, 2009). Provided the disadvantaged socioeconomic status of the SBC Latina/o residents, the public schools that serve their children represent an important locus of investigation.

Amblen Elementary School is one of the 13 elementary schools in SBUSD. Serving 594 students in total (293 female students and 301 male students), Amblen is situated within a small residential community on the

Eastside of Santa Barbara, part of the “invisible” side of Santa Barbara, where many low-income families reside. Reflecting the demographic and socioeconomic characteristics of the surrounding communities in which Amblen is located, 96.5% of the students at Amblen identify as Latina/o, and 90.6% of Amblen’s students are deemed socioeconomically disadvantaged, 97% of whom are Latina/o (CDE, 2014). Almost all of the students at Amblen are enrolled in the school’s free lunch program, a reliable indicator of the students’, and their families’, relatively impoverished statuses.

Amblen recently emerged from a five-year stint on the Federal Intervention Program Improvement (PI) for failing to make Adequate Yearly Progress (AYP) for the overall percentage of students achieving “proficient” status in English-Language Arts (ELA) standardized examinations, currently at 50% (CDE, 2014). Eighty-five percent of the students at Amblen are classified as English Language Learners (ELLs) (CDE, 2014).

In California, the fifth grade is also an important year in students’ early educational careers, as students are subjected to the California Standards Test (CST) in science for the first time (CDE, 2011). Because of this, a significant amount of effort, resources, and time is expended in preparation for this examination, the results of which further enroll youth in the high-stakes competition for everything from class placement to school funding, ranking, and reputation in the years to come. Despite Amblen’s proclaimed attendance to individual achievement and science education (i.e., Amblen

employs a full-time science enrichment specialist [Mr. Benzen] who educates students strictly about science on a weekly basis), only 45% of the fifth grade students met or exceeded state Standardized Testing And Reporting Program (STAR) science standards, well below the SBUSD (64%) and state (60%) averages for the 2011-2012 school year (SBUSD, 2013).

In a conversation I had with Mr. Benzen near the end of the month of April 2013, I asked him about the standardized testing that was about to take place that week (English-Language Arts and Math) and then again in the following week (Science). Mr. Benzen told me:

> This year is strange, because Amblen will be assessed only for its science scores. I do not understand how a school can be ranked on the basis of its collective performance on only one subject. [Ms. Carmille, the school principal] stressed the importance of these tests to the teachers, so there definitely is an element of pressure at work here. (personal communication, April 28, 2014)

I asked Mr. Benzen how Amblen will be evaluated from these tests, and he told me that the results of the tests will be used to compare Amblen's performance (i.e., a metric known as the Academic Performance Index [API]) to other schools in SBUSD as well as other schools in the state. In other words, the status of Amblen and of other schools, as "good" schools, is entirely based upon how well they perform on standardized tests. Amblen had been under surveillance—in terms of its performance as measured by

standardized test scores—for the previous five years, but had recently gotten out of it. Mr. Benzen told me that what could happen in these situations (i.e., if the scores were not to improve after a five-year period) is that the state can intervene and then dispense with the faculty and staff, and then bring in their own resources to turn the school around, adding that this pressure on the state ultimately comes down from the federal level.

In light of the above considerations, the fifth grade is not only an important year in these students' educational trajectories; it also marks a crucial moment in youth psychosocial development and understandings of self. Between the ages of about six to 13, children are regularly engaging in developing a sense of identity and personal worth, especially in striving to feel competent and productive (Myers, 2007).

Keeping in mind my central research questions, and given the above considerations, this research enterprise necessitated the sampling strategy I chose to employ (i.e., nonprobability purposive sampling [see below]), as my informants were not randomly selected, but rather, intentionally and purposefully selected (Bernard, 2011), given their position as elementary-aged tracked Latina/o science students.

(3.4.2.) Sampling Strategy and Informant Selection

This dissertation research called for a nonprobability purposive sampling strategy to establish my initial study population (i.e., *all* fifth grade

students (N=63) at Amblen Elementary School), as nonprobability samples are most appropriate for collecting data on in-depth labor-intensive case studies (Bernard, 2011). In order to determine the ways in which students are impacted given their placement within a particular classroom, I approached each classroom as its own ethnographic case study (Merriam, 1998).

My justification for treating each classroom as its own case study was both methodological and theoretical. One reason for doing so was that it had been dictated by my central research questions; broadly, I wanted to describe a cultural phenomenon within the American public education system, tracking, and how it is experienced by those under the purview of its implementation, yet specifically, my aim was to demonstrate the obstacles faced by tracked Latinas/os and the ways in which these obstacles curtail academic achievement, especially in science.

Another reason for treating each classroom as its own case study was that it complements my theoretical framework, namely, that each classroom operates within a unique social structure consisting of the patterns of student and teacher expectations as well as different sets of normative practices actively promoted and reproduced by those within it (Carlone et al., 2011; Sewell Jr., 1992). Conceptualizing each classroom as such allowed me to understand how the opportunities to succeed, perceptions of school success, and school science identify claims performances are all mediated and shaped

by the social structure of each classroom (Hatt, 2011; Holland et al., 1998; Vågan, 2011).

To achieve a complete understanding of the ways in which school experience, perceptions of school success, and school science identify are interconnected as well as mutually constitutive, I shifted my analytical focus from the social structure of the classrooms to the individual students (Shanahan, 2009). Throughout my time at Amblen, I developed in-depth individual case studies (Mallya et al., 2012; Reis & Roth, 2010; Taber, 2000) selected via a theoretical sampling strategy during (P_1) of data collection, to guide the selecting of important cases for study (Charmaz, 2000, 2002, 2006). This initial phase—marked exclusively by participant observation and the composition of detailed ethnographic fieldnotes—was an iterative process marked by the continual and systematic review and reflection upon all fieldnotes.

This continuous methodical evaluation allowed me to identify important patterns—and violations of these patterns—as they emerged from the data (Bernard, 2011; Grbich, 2007) regarding students' opportunities to succeed and perceptions of school success across both classrooms. For example, I learned rather early on in (P_1) that students in the low-functioning group were not expected to succeed in the same ways, and with the same frequency, as the students in the high-functioning group.

According to the findings and theoretical models developed during this initial phase, I was able to identify several students (i.e., three from each classroom) that either regularly embodied, resisted, or worked to transform (e.g., hybridize) what it meant to be a successful science student (Brown, 2004; Calabrese Barton & Tan, 2010; Carlone et al., 2011; Kane, 2012). Throughout the subsequent phases (P_2) and (P_3), these students served as key informants (Spradley, 1979), and while nearly every student across both classrooms exhibited elements of embodiment, resistance, and/or hybridization—at times in varying combinations—these key informants served as representatives of emergent ideal types, or, "Social attitudes regarding identities, roles, dispositions, and other self-related structures that are organized into a coherent system of normative expectations" (Dennis Korth, 2007, p. 78). These case studies brought to life and substantiated my developing theoretical models regarding how one successfully navigates school and school science through the lens of individual experience. There will be much more detailed and descriptive information provided regarding these students in the following chapter, *Chapter Four (Central Findings)*.

3.5. Confidentiality, Privacy, Consent, and Recruitment

(3.5.1.) Confidentiality, Privacy, and Safeguards

It is important to take the time to discuss the potential confidentiality and privacy risks incurred by all participating subjects, as well as the

safeguards I implemented to greatly reduce them. I consider the following areas to be of special importance: Any information (e.g., observations, statements, recordings, etc.) that may potentially compromise the anonymity and/or privacy of individuals (e.g., students, teachers, school officials, etc.); the loss of anonymity of individuals or the research setting in any future presentations, publications, or reports regarding the results of this research; and, mandatory reporting to outside funding agencies. With regard to the latter, I received funding to complete this project from the University of California Santa Barbara (UCSB) in the form of a Humanities and Social Sciences Research Grant, as well as from the UCSB Chicano Studies Institute in the form of a Doctoral Dissertation Grant. I have also received funding from the University of California Institute for Mexico and the United States (UC MEXUS) in the form of a Dissertation Research Grant. Each of these funding bodies have instructed me to submit brief reports of the results of this research, and in doing so, the anonymity of the individuals that participated in this research has never been compromised.

I consider confidentiality and privacy to be extremely important components of the safety and risk management for all parties participating in this research. I have developed the necessary safeguards to ensure that I am protecting the individuals involved in this research to the very best of my abilities. The 63 students who took part in this research (in some capacity), along with participating teachers and other school officials, were assigned

pseudonyms in an effort to protect their identities in any future presentations, publications, or reports regarding the results of this research. As an additional privacy measure, I have assigned a pseudonym to the school (Amblen Elementary School) in which the majority of this research was carried out.

(3.5.2.) Consent and Recruitment of Research Subjects

The choice to work with Amblen Elementary School and its fifth grade class was intentional for the reasons cited above, however, this research would not have been possible without the continued consent and participation of the students, their parents, and the teachers of Amblen, including the school principal (Ms. Carmille). Dating back to January 2013, I established good rapport (Young Jr., 2004) with Ms. Carmille, the primary teachers of the two fifth grade classrooms (Miss Thorton [high-functioning classroom teacher] and Miss Weaver [low-functioning classroom teacher]), and the full-time science enrichment specialist (Mr. Benzen) at Amblen. Prior to the official commencement of my doctoral dissertation research in August 2013, I explained my research objectives and the anticipated protocol to these individuals, and all had agreed (either verbally or in writing) to participate in this research.

Per the conditions and stipulations of my home university's (UCSB) Office of Research and their Application for the use of Human Subjects, I obtained informed consent from the following individuals: Ms. Carmille; Miss

Thorton and Miss Weaver; Mr. Benzen; the parents of the fifth grade students; and, the fifth grade students themselves. From Ms. Carmille, as well as the parents of the fifth grade students, I obtained written consent. From Miss Thorton, Miss Weaver, Mr. Benzen, and the fifth grade students, I obtained verbal consent. To obtain consent, I crafted various consent forms, using the "Model Consent" template offered by the UCSB Office of Research, with language tailored to the various individuals from whom informed consent was required. There were no payments or rewards offered at any time, to any participant, for participating in this research. All subjects were given the opportunity (either verbally, or in writing) to consent, or to not consent, to this research without the intervention of any element of force, fraud, trickery, duress, coercion, or undue influence on the subject's decision. All of the consent forms were written in English (with the exception of the parental consent form, which was written in both English and Spanish) and in the second person (i.e., with the use of "you"). Every effort was made to use language that was clear, concise, jargon-free, and understandable. In addition, it was made clear to all participating subjects, that should they wish to decline to participate (either partially or fully) to any or all aspects of this research at any point throughout the study period, that they were absolutely free to do so without penalty and regardless of their level of consent at any point prior. In what follows, I will describe the process for obtaining informed consent from the each of the respective research participant groups.

To obtain informed consent from Ms. Carmille, I met with her in the main office of Amblen Elementary School during the first several weeks of the 2013-2014 school year, and I presented to her the consent form I generated using the "Model Consent" template. I explained to her the elements of informed consent and reviewed with her, in person, all aspects of the form she had questions about. She was given the opportunity (in writing) to consent, or to not consent, to the research protocol, thereafter providing me with permission to conduct my research at Amblen.

The process for obtaining informed consent from Miss Thorton, Miss Weaver, and Mr. Benzen, was very similar to that of Ms. Carmille, except that I met with each of them individually, in their respective classrooms, when they were not teaching. Similarly, I read aloud to them the elements of informed consent that I had generated using the "Model Consent" template. For these teachers, obtaining verbal consent was sufficient given that the research protocol presented virtually no risks. Furthermore, written consent is not required to engage adults in informal conversations as I did, for example, regarding their perceptions of science, its importance, effective science education, as well as their general feelings about education, teaching, tracking, and the like.

From the students, I obtained verbal consent. This was an appropriate method for obtaining consent, because for these students, the proposed research presented no more than very minimal risk, if any at all. The methods

chosen for this study were as minimally invasive as possible, greatly minimizing risk (discussed in much greater detail in below) and ensuring that what was asked of each research participant was not too demanding.

I came to Amblen to meet and introduce myself to the students for the first time during this first full week of school. I chose to meet them during their science “rotations”. Early on in each of the three science rotations, Mr. Benzen gave me the opportunity to introduce myself. I read aloud to the students the elements of informed consent that I had generated using the "Model Consent" template, and explaining that throughout the course of the school year, all participating students would be asked to take part in two individual interviews, each lasting no longer than 45 minutes. I also told the students that they would be asked to participate in several other exercises (discussed in Primary Research Methods in much greater detail below). I then informed them that the only other source of data I would collect while at Amblen would be my own observations recorded during school hours.

I mentioned to the students that I would be visiting Amblen each week, and that I would be in Miss Weaver’s and Miss Thorton’s classrooms every time they taught science. While many students expressed great joy upon hearing that I would be with them for the year, and that they would get the opportunity to participate in interviews (while excitedly pumping their arms above their heads), others seemed entirely unmoved, while some students were more curious about the matter. Rocio, a girl from rotation group two, and

a member of Miss Thorton's class, looked down at my brown fieldnotes journal and then back up at me to ask, "Are you studying us?" Every student verbally consented to participate in this research. However, in order to proceed fully with data collection, I also needed to obtain informed consent from each student's parent/s, as all of the students were minors (10 or 11 years of age) at the time of the study.

To obtain informed consent from the students' parents, I sent the students home with "Parental Consent" forms on the same day that they verbally consented to participate in this research. I anticipated that sending students home with the parental consent forms would pose no difficulties or inconveniences for the students or for their parents. Should parents have had any questions, comments, and/or concerns regarding this research, they were instructed within the consent form to contact me via phone or e-mail. Students were instructed to bring back the consent forms signed, or unsigned, meaning that their parents have either consented, or have not consented, respectively, to this research.

3.6. The Students and Teachers of the Fifth Grade

(3.6.1.) The Students

The students of both classrooms were all either ten or eleven years of age at the time this research was conducted. There were 33 students (18 girls and 15 boys) in the high-functioning classroom, and 30 students (15 girls and 15 boys) in the low-functioning classroom. The overwhelming majority of the students are second-generation migrants from Mexico to the United States. Almost all of the students were born in the United States, except for one boy, Rodrigo, who was born in Mexico. Additionally, almost all of the students' parents were born in Mexico except for: Rocio, whose parents were both born in Guatemala; Letty, whose parents were both born in the United States; Jorge, whose parents were both born in the United States; and Catalina, whose mother was born in the United States. The majority of the students are bilingual in that they speak both English and Spanish, however some students (Letty, Catalina, Adrian, and Corazon from the high-functioning group, and Francisco, Jorge, and James from the low-functioning group) do not speak Spanish with conversational fluency, while the only student who cannot speak English is Rodrigo. This information is tabulated clearly in Table 1.6. and Table 1.7. below.

The majority of the fifth-grade students at Amblen, and indeed the majority of the students at Amblen writ large, comes from socioeconomically disadvantaged backgrounds. Very few of the students' parents have pursued

degrees in higher education, and for many of the fifth graders, they wish to be—in addition to some of their older siblings—the first members of their family to attend college. The overwhelming majority of these students' parents have obtained part- or full-time manual labor positions in the gargantuan services industry in the greater Santa Barbara city area. Catalina, of the high-functioning group, represents one exception to this: Both of her parents attended, and graduated, from fully accredited four-year institutions with degrees in education. Both of her parents are full-time teachers working in SBUSD. More common employment positions held by the students' parents include the following examples: Aaron, whose mother cleans houses; Maricruz, whose father is a short-order cook at a seafood restaurant in downtown Santa Barbara; Malina, whose mother drives some of the buses that make up the Santa Barbara Metropolitan Transit District (MTD); and Jorge, whose father is a local carpenter. Several of the students' parents are unemployed as well.

As with their parents' educational levels and occupational statuses, and based on my interviews with the students concerning their home lives, there did not appear to be much variation. Across both classrooms, most of the students live in low-income areas of Santa Barbara, and many of them within walking distance of Amblen, in which the surrounding residential communities, marked along lines of *de facto* racial segregation, suffer

disproportionately from food insecurity and other social ills directly related to poverty.

I learned during many of my interviews with the students that they live in small homes or apartments that they share with their nuclear family as well as extended family members. Some students' households consist of a mother, a father, multiple siblings (e.g., some with only one sibling [e.g., Catalina]—no student was an only child—and others with up to as many as eight siblings [e.g., Ramon shared with me that he has eight brothers]), in addition to extended family members (e.g., most commonly aunts, uncles, and grandparents). While many students opt to walk home alone after the school day ended in the late afternoon, household composition became visible when for other students being picked up by members of their family. It was quite common for young mothers and fathers, grandmothers, big brothers and sisters, cousins, and various other family members to pick up students after the school day had ended.

For the most part, the majority of students appeared happy to be in school—undoubtedly for many, it offered a reprieve from the daily hardships encountered in their home lives. The following series of snapshots from my fieldnotes offers glimpses into the personal lives of the fifth grade students at Amblen, highlighting some of the hardships they regularly endure:

> James is upset that his father (in another city in in-patient rehab for alcoholism) has left his family earlier in the year, and his mom already

started dating another man, whom James does not like, and whom he always asks why he is there, adding that he just wants his dad back. Then, I learn that his grandmother is a Jehovah's Witness, while his mother is Catholic. When she asks James to attend a *Quinciñera*, he tells his mom that he is not Catholic, but that he is a Jehovah's Witness instead. (fieldnotes, May 19, 2014)

Miss Thorton shares with me a story about Oscar: He recently talked back to the speech therapist at school, when taking note of her pregnant stomach and saying to her, "It looks like *you* didn't use protection!" He apparently knew that what he said would get him into trouble, so he went to hide form Miss Thorton before she could find him, but in the end, she did find him, and after she was informed of the incident, she marched him straight to the principal's office, where Ms. Carmille asked him to think about all those that his actions affected. Oscar then cited the speech therapist, Miss Weaver, and Ms. Carmille, but leaving out Miss Thorton, Ms. Carmille prompted, "And what about one of the most important people you are forgetting about?" When he turned to Miss Thorton, he exclaimed "…and Miss Thorton!" and began sobbing. Miss Thorton then supplies some of context around Oscar's comment by adding, "Oscar's dad got someone [else] pregnant…" (fieldnotes, March 3, 2014)

Joanna shares, “My parents fight a lot but they are still together”. She then shares with me more from her personal life. She tells me that she deeply misses her great grandmother (who died from “being sick”), and her great grandfather (who died from “drinking and cigarettes”—she points to her fingers to demonstrate the discoloration of this man’s fingers). She says she went to the funeral on a Thursday morning, last year, when she was in the fourth grade. She is very sad when relaying this information to me. “I miss her”, she says. (fieldnotes, January 6, 2014)

Rocio begins telling me about a “sad story”. Once she begins speaking, I become absorbed by her story. She tells me that her bigger cousin’s son, who is in the 8th grade and attends a local junior high school, has been missing now for two weeks. She tells me that he cut out of class a few weeks ago with his girlfriend, and with another friend of theirs, also a girl, to Lompoc, CA, and they have not turned up in several weeks. She tells me that his name is Thomas and that the reason why people know they went to Lompoc is because someone close to them had tracked their location using his mobile phone’s GPS. She says that his parents are very sad and worried. Also, she leans in and whispers as if to say these next few lines quite confidentially,

“They say that they escaped because his girlfriend is pregnant [they are 14 years old]”. Then she adds, “He plays soccer with my older brother, and they were playing on the same field, but against each other, and he asked my brother to come over to smell his shirt, and he said that it wreaked of marijuana. He then made like he had to go somewhere and then ran away”. (fieldnotes, May 12, 2014)

Table 1.6. The Students of the High-Functioning Classroom.

Name	Sex	Place of Birth	Parents' Place of Birth	Language/s Spoken
Rocio	F	U.S.	Guatemala	English and Spanish
Letty	F	U.S.	U.S.	English
Bianca	F	U.S.	Mexico	English and Spanish
Angelica	F	U.S.	Mexico	English and Spanish
Joanna	F	U.S.	Mexico	English and Spanish
Catalina	F	U.S.	Mexico	English
Alexis	F	U.S.	Mexico	English and Spanish
Maggie	F	U.S.	Mexico	English and Spanish
Brianna	F	U.S.	Mexico	English and Spanish
Stephanie	F	U.S.	Mexico	English and Spanish
Patricia	F	U.S.	Mexico	English and Spanish
Maria	F	U.S.	Mexico	English and Spanish
Sarah	F	U.S.	Mexico	English and Spanish
Vanessa	F	U.S.	Mexico	English and Spanish
Hilda	F	U.S.	Mexico	English and Spanish
Mariela	F	U.S.	Mexico	English and Spanish
Yeli	F	U.S.	Mexico	English and Spanish
Corazon	F	U.S.	Mexico	English
Pablo	M	U.S.	Mexico	English and Spanish
Juan	M	U.S.	Mexico	English and Spanish
Charlie	M	U.S.	Mexico	English and Spanish
Samuel	M	U.S.	Mexico	English and Spanish
Raymond	M	U.S.	Mexico	English and Spanish
David	M	U.S.	Mexico	English and Spanish
Trevor	M	U.S.	Mexico	English and Spanish
Gamaliel	M	U.S.	Mexico	English and Spanish
Oscar	M	U.S.	Mexico	English and Spanish
Adrian	M	U.S.	Mexico	English
Diego	M	U.S.	Mexico	English and Spanish
Felix	M	U.S.	Mexico	English and Spanish
Michael	M	U.S.	Mexico	English and Spanish
Ricardo	M	U.S.	Mexico	English and Spanish
Noel	M	U.S.	Mexico	English and Spanish

(Source: Grayson Ford Maas Dissertation Research, 2015).

Table 1.7. The Students of the Low-Functioning Classroom.

Name	Sex	Place of Birth	Parents' Place of Birth	Language/s Spoken
Malina	F	U.S.	Mexico	English and Spanish
Jackie	F	U.S.	Mexico	English and Spanish
Savannah	F	U.S.	Mexico	English and Spanish
Jennifer	F	U.S.	Mexico	English and Spanish
Illy	F	U.S.	Mexico	English and Spanish
Monse	F	U.S.	Mexico	English and Spanish
Gissel	F	U.S.	Mexico	English and Spanish
Anissa	F	U.S.	Mexico	English and Spanish
Anna	F	U.S.	Mexico	English and Spanish
Elena	F	U.S.	Mexico	English and Spanish
Maricruz	F	U.S.	Mexico	English and Spanish
Gabby	F	U.S.	Mexico	English and Spanish
Sophie	F	U.S.	Mexico	English and Spanish
Gloria	F	U.S.	Mexico	English and Spanish
Selena	F	U.S.	Mexico	English and Spanish
Francisco	M	U.S.	Mexico	English
Jorge	M	U.S.	Mexico	English
James	M	U.S.	Mexico	English
Rodrigo	M	Mexico	Mexico	Spanish
Cesar	M	U.S.	Mexico	English and Spanish
Aaron	M	U.S.	Mexico	English and Spanish
Kevin	M	U.S.	Mexico	English and Spanish
Javier	M	U.S.	Mexico	English and Spanish
Alejandro	M	U.S.	Mexico	English and Spanish
Jacob	M	U.S.	Mexico	English and Spanish
Noe	M	U.S.	Mexico	English and Spanish
Lalo	M	U.S.	Mexico	English and Spanish
Felipe	M	U.S.	Mexico	English and Spanish
Ramon	M	U.S.	Mexico	English and Spanish
Chris	M	U.S.	Mexico	English and Spanish

(Source: Grayson Ford Maas Dissertation Research, 2015).

For the students of both classrooms, the ability to speak both English *and* Spanish was important, albeit for different reasons. Being able to speak English well was understood by most students as a way to demonstrate that one is "smart", and also as an indicator of one's national membership as a "good American". Of course, this logic implies that if one cannot speak English well, they are understood to be *less* smart and *less* American.

Conversely, one's ability to speak Spanish well served as an indicator of one's cultural identity and of one's claim to being a "true Mexican". For example, Jorge's—a student of Miss Weaver's (the low-functioning classroom teacher)—status as a "true Mexican" was questioned when Cesar—another student of Miss Weaver's—called Jorge a "fake Mexican" because he could not speak Spanish as well as the rest of the students. In response to Cesar's accusations (which were made in front of Miss Weaver and several other students during lunch), Jorge stood up and tentatively recounted how he wanted to say "*caro*", but he "messed up" and said "Carl" instead, and that Cesar made fun of him for this, adding that he is not really a "true Mexican". Miss Weaver, at a loss, looked up at Jorge, who was still standing, and did not even address this issue; she simply did not know how to do so. Language use was an important issue inside of the classrooms as well.

As of the passing of Proposition 227 in 1998, effectively eliminating bilingual education in California public schools (Revilla & Asato, 2002), these students—throughout the entirety of their elementary school experience—

have not been *officially* allowed to participate in classroom activities in Spanish. While their formal school instruction has been dominated by the use of English, these students employ Spanish in creative ways to maneuver through the school's and their classroom's institutional, figured, and social landscapes. The following example, captured during a lesson about the moon and its phases with Mr. Benzen (the science enrichment specialist—discussed in greater detail below), illustrates the institutional enforcement of the "English only" policy of the school:

> Mr. Benzen distributes the activity for the day, a worksheet entitled "MOON Phases", in which the students learn about the eight different phases of the moon (i.e., New Moon, Waxing Moon Crescent, 1st Quarter, Waxing Gibbous, Full Moon, Waning Gibbous, 3rd Quarter, and Waning Crescent). Mr. Benzen asks Corazon to hand out worksheets, but she shakes her head from left to right, indicating that she does not want to, when Cesar offers to do so and Mr. Benzen obliges. Mr. Benzen then asks me to hand out pencils. While the girls of the room seem to be following along with the assignment very diligently and without talking, the boys complete the assignment more begrudgingly and with much more chatter and laughter. Mr. Benzen interrupts Oscar's work to tell him to focus and to pay attention. Oscar objects, "But I was just helping someone else". Mr. Benzen, having none of it, retorts, "Well, some students are slow, and some students

> are fast; they'll just have to catch up". Mr. Benzen then addresses the other side of the room, where he hears Juan's voice speaking in Spanish. "Come on, Juan, you are in *school*; use your English", Mr. Benzen commands. Corazon defends Juan, pleading, "He wasn't even saying anything, he was just saying something about dogs". Knowing that Juan was not "Just saying something about dogs", Mr. Benzen asks both Juan and Corazon to "Say 'dog' in Spanish". When they both utter "*perro*", a word Mr. Benzen had not heard Juan use all day, he replies, "See, that's *not* what you said', and then to Corazon, "Are you his defense lawyer? I do not need your help'. (fieldnotes, January 27, 2014)

In the above example, Mr. Benzen sought to reinforce the institutional norms of the school—and by extension, all other public schools in California—however in doing so, he also actively denigrated and repressed Juan's ethnolinguistic identity as a Latino Spanish speaker. Corazon, attempting to defend Juan, exercised her own agency in resisting this repression.

Attending to these students' discursive practices has been crucial in following how Latinas/os—when divided into separate tracked (i.e., unequal) classrooms—claim and perform successful school science identities. "Educational institutions play central roles in authorizing and circulating ideologies of language through which 'educated' and 'un-educated' language use are associated with differentially valued types of people" (Wortham, 2008,

p. 39). In other words, one way I strived to understand students' various discursive practices was in the context of how it reflected and shaped their agency and identity performances within school (Arnold, 2010; Brown, 2004; Calabrese Barton & Tan, 2010; Kane, 2012). In this sense, I understand language as *shaping* reality, not simply *reflecting* it (Ahearn, 2001).

The ability to be *truly* bilingual functioned as a form of capital in both classrooms, whereby students were seen as lesser, or as cultural outsiders, if they could not speak Spanish. Jorge was not the only student to be ridiculed by his peers for failing to exhibit sufficient Spanish fluency; this fate had also befallen Adrian, Corazon, and Catalina. This contempt typically manifested in the spaces outside of those designated by formal and structured learning, such as the cafeteria (during lunchtime) and the playground (during recess). These spaces operated as those where students, and not teachers, could fulfill authoritative roles, whereby members *inside* the peer group (and not *outside* of it [e.g., teachers, etc.]) could exert dominance over, influence, and police one another.

Language use was not the only feature of the students' social landscape that was continually monitored from within the peer group, but it certainly was one of the most salient features, as further examples will demonstrate in Chapter Four (Central Findings). Perhaps even more prominent were the collective internalization of classroom placement and the associated sentiments of prestige associated with one's placement.

Specifically, one was generally regarded as “cool” if they were members of the high-functioning group. In this context, being cool became a marker of popularity, an ideal, and something to be desired, because it signaled the approval and respect of one’s peers. Those that were designated as “cool” were generally thought to have more “fun” and to be “smarter”.

As with students’ informal language use assessments of one another, the visible spaces where students would assemble formulations of who is cool, and who is not, manifested outside of those designated by formal and structured learning, such as the cafeteria (during lunchtime) and the playground (during recess). In the cafeteria, for example, members of the high-functioning group would frequently sit with one another, while members of the low-functioning group would also sit among mostly members of their own group. Similarly, during recess, high-functioning classmates would typically play with one another, but to a much lesser extent, with students in the low-functioning group. Further, students in the high-functioning group would also engage in mockery and ridicule of the low-functioning students, for example, by referring to them as “dumb” or “slow”. In these ways, the students were reproducing the institutional segregation that the school operationalized, and mapped onto it their own youth-centered system of symbols and values, namely in the bestowal of the highly coveted designator of approval that so many youth crave: who is cool and who is not. Further

examples regarding students' perceptions about classroom placements will be demonstrated in Chapter Four (Central Findings).

(3.6.2.) Mr. Benzen

Mr. Benzen was the students' science enrichment specialist; he is a quiet, reserved, and gentle, yet very pleasant white man in early 40s. He is about 5'9", of slender build, and keeps a well maintained short beard. On the day that I met the students (and as I would come to find on most other days as well), he was wearing a long white lab coat—of the stereotypical variety that laboratory chemists usually don—however, on Mr. Benzen's lab coat the word "GEEK" appears in bright red letters in the space where one might usually see a nametag. Mr. Benzen indeed fits the stereotypical mold for popular perceptions of what a scientist looks like.

There existed no overlap in the times in which science was taught in the two primary classrooms—and as mentioned previously, all of the students received science instruction in their rotation groups from Mr. Benzen for one hour on Mondays, a day in which neither primary classroom teacher would teach science—thus allowing me to fully observe each and every science lesson for both classrooms throughout the entire school year.

The door to Mr. Benzen's classroom—a small one-room building unconnected to the rest of the school, yet only a few dozen feet from the other classrooms—is covered with small objects (e.g., clocks, compasses,

etc.) that are oriented in such a way to spell “SCIENCE”, and just beneath, a pennant that reads “MIT, Massachusetts Institute of Technology”. Upon entering the room, one’s eyes feel overwhelmed. Almost every single inch of wall space is covered. There are long worktables lining both sides of the room. Each table has several chairs on both sides for the students to sit (this is a curious seating arrangement, as half of the seats face *away* from the front of the room). Each workbench has a small metal dish on top of it containing markers, colored pencils, and pencils. One of the items of the room that always grabbed the attention of the students is a flat-screen TV mounted in the corner of the room.

In the back of the classroom, there is a yellow handwritten poster titled “Lab Rules”, which Mr. Benzen references whenever he feels that students need to be “reminded” of how “good scientists” should behave. The lab rules are as follows: “Ask questions, Actively listen to every speaker, Raise your hand to speak, Use science materials properly, and Refocus if you aren’t following the rules”. During the first week of school, when Mr. Benzen explained the lab rules, he explained that these rules are what “good scientists” do. He also made sure to highlight the importance of the last rule, pointing out the specifically designated “Refocus Area” in the rear of the room, which students are sent to when they cannot focus (i.e., follow the rules).

(3.6.3.) Miss Thorton

Miss Thorton (27), the teacher of the high-functioning students, is a tall (5'9"), confident, young, white woman with shoulder-length brown hair. She feels comfortable commanding a classroom, and is not afraid to fill the role of disciplinarian if need be. Although, she is also quick to smile, laugh, and joke around with her students as well. Miss Thorton achieved a Master's Degree in Education. She has been teaching the fifth grade for three years, and feels like she has a pretty good handle on what to expect from students as well as how to manage administrative expectations.

For each of the three years, she has been assigned to the high-functioning group. During one of our many conversations about tracking, she told me that Ms. Carmille (the school principal) confided the following: "She just sees me as a teacher for 'advanced' students, she would not want to move me; this is what she told me. I did not know if I should be offended, I mean, does she think that I could only teach *gifted* students successfully? Other teachers here were jealous of me that I got to have the 'high-functioning' group, as if it is easier". I asked her if she thinks there is some sort of social hierarchy at work whereby the teachers attain more prestige if they are assigned to teach the "advanced" students. She confirmed that this is true, nodding her head up and down demonstratively, with lips pursed.

There is a lot going on in Miss Thorton's classroom. The walls are covered with posters, students' work, and other instruction-related items.

Students' desks are arranged into eight clusters of four desks each with two boys and two girls per cluster. Boys and girls do not sit next to one another but across from one another. Each one of these clusters has been assigned a particular sport (e.g., baseball, basketball, football, etc.), and Miss Thorton refers to these table-groups by the name of their assigned sport as a time saving mechanism. As with Mr. Benzen's classroom, this classroom is equipped with a large flat-screen TV, which is also connected to a small projector to display documents for the entire class to see. This TV is equipped to stream cable channels as well as the Apple TV application, which is wirelessly connected to the classroom iPads that have been distributed to Miss Thorton's students for their use while in school (i.e., mainly for in-class research projects, etc., although students try to appropriate them for other uses [e.g., downloading music, games, pictures, etc.]). Most impressive, students have been instructed on how to "mirror on", which displays (or "mirrors") the contents of an iPad screen onto the classroom TV for the class to see.

Everyday on Miss Thorton's whiteboard, in addition to several instructional lessons, there appears the students' daily schedule broken down into 30-minute chunks, as well as a section blocked off on the far right-hand side, with written questions corresponding to recent material covered, such as the following: "How does narrative writing help us understand vivid imagery?";

“How can you apply multiplication with decimals to real-life math?”; and, “How can severe weather affect our daily lives?”

Behavior (bad or good) plays an important role in Miss Thorton’s classroom. Toward the middle of the whiteboard, there is a section titled “Take a Knee”, which is a permanent feature of the classroom. Throughout the school day, Miss Thorton may record the names of students under this heading as a method for keeping track of students’ daily behavioral missteps. The names on this list are visible to the entire class. When a students receives a “checkmark” next to her/his name, it serves as their final warning before a disciplinary note is to be sent home to their parents, or instead, to warrant a trip to the principal’s office.

(3.6.4.) Miss Weaver

Miss Weaver (25), the teacher of the low-functioning group, is a young, white woman with shorter than shoulder-length blonde hair. She is less confident in her teaching abilities and is less comfortable commanding a classroom than is Miss Thorton. Presumably, most of the reason for this is due to the fact that this is Miss Weaver’s first year teaching the fifth grade. The previous school year was her first year teaching, when she served as one of the pre-Kindergarten teachers at Amblen (n.b., in public schools—and Amblen is of no exception—teachers are often shuffled around to serve the needs of the school, even if they have had no prior experience in teaching a

particular grade-level [as was the case with Miss Weaver], or even if the teachers feel they are not qualified to successfully manage the tasks they have been assigned by administration). Similar to Miss Thorton, Miss Weaver is unafraid to fill the role of disciplinarian if need be. While Miss Weaver does not possess a Master's Degree, which is not a prerequisite for public school teaching (although those with Master's Degrees are paid higher salaries [roughly $1,000 more] for the same amount of work and hours served than those without), she does hold a teaching certification, which *is* requirement to teach.

With regard to Miss Weaver's classroom composition, relative to that of Miss Thorton's, some similarities and some differences were immediately evident. Most noticeably, Miss Weaver's room was far less decorated than was Miss Thorton's: There are fewer posters, less student work prominently displayed, and the like. Similarly, students' desks are arranged into six clusters of five seats each with boys and girls sitting across from one another. Each cluster is assigned the name of a continent, excluding Antarctica. Also similar to Miss Thorton's room, this room is equipped with a large flat-screen TV, which is also connected to a projector. On the whiteboard, the students' agenda is listed daily, and next to this is another section with several students' names written down—these are the names of students that have gotten into trouble for misbehaving and/or have been asked to leave the classroom for a specified period of time because of it.

Behavior was a much more salient issue in Miss Weaver's classroom than it was in Miss Thorton's classroom. Miss Weaver paused lessons on a daily basis to remind students about their "bad behavior". On the whiteboard, Miss Weaver writes the names of the six continents corresponding to each of the table clusters. Next to each continent appear marks (e.g., "I", "II", "III", "IIII", etc.). These are "table points" given or taken away to each table throughout the school day for good or bad behavior, respectively. Take the following exchange, for example, when Miss Weaver instructed students to get ready for an upcoming activity about water: She told the class that they needed to be quiet, so they can hear what they need to do. Some tables grew quiet rather quickly, while others did not. After waiting for about one minute or so, Miss Weaver announced to the class, "I'm taking a table point away from South America and from Asia; one person can ruin it for the whole group".

Aside from behavioral issues, one of the primary differences between the two classrooms is the fact that Miss Weaver's students participate daily in a program called "READ 180", while Miss Thorton's students do not. READ 180 is intended to help "struggling readers" in grades four through 12, especially in preparing them to raise their achievement scores on English-Language Arts standardized examinations. Instead of individual iPads—like the students in Miss Thorton's classroom received early on in the year—Miss Weaver's students had to work, everyday, on classroom desktop PC computers (eight computers shared among 30 students) quietly, by

themselves in the back of the room, to complete a series of reading assignments. Other times, students were instructed to read from one of the many READ 180-approved texts prominently displayed in Miss Weaver's classroom. Further detailed information regarding the importance of READ 180 will be demonstrated in Chapter Four (Central Findings).

(3.6.5.) Miss Harding

For the students of the fifth grade, and especially for the low-functioning students, command and confidence in their use of the English language has important implications for how they experience and navigate school. In fact, the students of the low-functioning group had been assigned a special ELA tutor (known by the students as Miss Harding). She is a pleasant-mannered and quiet white woman with blond hair in her mid-twenties. She assists students that experience difficulties with reading and writing.

The first time I met Miss Harding, during a Monday rotation lesson with group three, she told me that she regularly comes to classrooms to help out the "ELA students" (as they are called by the teachers) during particular reading and writing activities and exercises to provide individual assistance to those students demonstrating the most difficulty with grasping the lessons. This, I would come to learn, prevents these students from being pulled out of class; otherwise, they would be taken out of their regularly scheduled class period to have one-on-one instruction with Miss Harding, whereby she might

focus on vocabulary, spelling, pronunciation, writing, etc.). In her own words, "*They* [Ms. Carmille and some of the teachers] don't want to pull students from class as often, so it's better if I just stay in the classrooms to help particular students as they need it". While this arrangement may seem beneficial and well-intentioned, rarely did I observe Miss Harding work one-on-one with any student *during class*, rather, she mostly sat in the back of the room passively watching the lessons and the students, sometimes working on crossword puzzles she would bring with her. When I asked her if she ever provided her ELA-tutor services to the students in Miss Thorton's class she told me, "I do not have any students in Miss Thorton's class, because they are all the high-functioning students", shaking her head, "and all of my students are in Miss Weaver's classroom, because they are the low…". She expected me to know what she meant, and I did, but it was nevertheless curious that she could not bring herself to say "low-functioning", as if on some level, she understood that the designation placed on these children is somehow unfair, or at the very least, unfortunate.

(3.6.6.) Teachers' Perspectives about Tracking

The following two sections contain descriptions of Miss Thorton's as well as Miss Weaver's thoughts on the practice of tracking, in general, including the ways in which they see that the intentional division of the fifth-grade students of Amblen has affected not only the students but *themselves*

as well—in terms of how they perceive themselves as teachers as well as the emotional toll that being a teacher can take. Below, I have selected three excerpts (one for Miss Thorton and two for Miss Weaver) taken directly from my fieldnotes. One selection transcribes an informal one-on-one conversation with Miss Thorton about the practice of tracking specifically, and it showcases how she simultaneously critiques and justifies it. Another selection is taken from a brief incident wherein Miss Weaver addresses her class after being let down by them during a unit on the circulatory system: Most notably, she intentionally compares the actions and abilities of Miss Thorton's students with those of her own students as a strategy in hopes of motivating her students to achieve more. The final selection captures an informal one-on-one conversation with Miss Weaver about tracking, but mainly her own difficulties in being the teacher of the group of students whom most expect *less* of and from.

(3.6.6.1.) Miss Thorton

The following conversation between Miss Thorton and I took place in the middle of March, with only a few months remaining in the school year, and importantly, after having plenty of time to reflect on her experiences with her group of students, as well as her role as the high-functioning teacher. Prior to this conversation, Miss Thorton and I were talking about some of the various idiosyncrasies and proclivities of the students of *both* classrooms. While we

talked, we ate lunch together in her classroom, while her students were outside playing during their break for recess:

> While pondering the notions of difference between the two classrooms, I share with Miss Thorton how some students (e.g., Elena from Miss Weaver's classroom) talked with me regarding their feelings about being in the "dumb" group (n.b., these are Elena's own words, and she is not the first student from Miss Weaver's classroom to employ similar language when referring to Miss Weaver's class). Miss Thorton's face reads as though she is surprised to hear this.
>
> Miss Thorton then asks me more about what the students say, and so I tell her that, for example, Elena has also told me, "Some students say that our class is the dumb class, that we are further behind, and that we need more help than Miss Thorton's class, but I don't understand why, because we are all humans". Miss Thorton shakes her head slowly from side to side, clearly a little troubled by what I have just told her. Then, after a few moments of contemplative silence, she share her own sentiments, "These students are no better than the other students, it's just that they learn *differently*", but then she adds in a more defensive tone, "You know, like, [*Miss Weaver's*] students are doing colonies reports and *we're* not; it's just *different*". I ask Miss Thorton to consider how Elena, in particular, might feel knowing that her twin sister, Joanna, is next door in *her* class. She

shakes her head as if to demonstrate that she just does not understand, or, that she simply does not know *what* to say.

Miss Thorton changes gears slightly by mentioning that she has talked with Ms. Carmille about this extensively, and that it is she who ultimately determines if the students in a particular grade are “leveled” or not (using Miss Thorton’s own language). She adds that if it were up to her, *every* student would be subjected to the same experience in school (i.e., there would not be different expectations placed upon the students).

I ask Miss Thorton what her thoughts are on the practice of tracking in general (i.e., whether it is a good or bad thing, etc.), and she confesses that she does not know, but she does confide that she thinks about it “all of the time”. From my vantage point, and having spent considerable time with the students of both classrooms, I suggest to her how debilitating it can be for students placed in the low groups. These are for the most part the very same students that are then funneled in to the low tracks in middle school and high school. I ask Miss Thorton rhetorically, “Is it any wonder why *some* students end up going to college, while others do not, or, maybe some *do* go but then only to drop out a few semesters later? I feel like we are setting them up for failure at such a young age that it becomes increasingly difficult for them to break free from this cycle as they grow older”. Miss

Thorton is quick to note how tracking in *high school* can be "problematic", but I try to push for her to consider how this is "all connected".

Miss Thorton considers what I have shared with her, and then decides to share a memory form *her* days in school. Miss Thorton remembers that when she was in school, she was "very good at reading and writing", but she was "terrible at math". In Miss Thorton's own words, "My teacher told me, 'You are not good enough at math to ever become a good teacher'. But look at me *now*, I teach math very well, so my placement in the slower math classes ended up being wrong. I think I just had a bad teacher".

I share with her more of my own feelings about tracking, namely, in how the different expectations placed upon students can be easily *understood* by them, and then *embodied* by them, resulting in a self-fulfilling prophecy whereby some students *under*achieve, while others *over*achieve, because they are expected to. I then ask Miss Thorton if she and Miss Weaver agree or disagree on what the best course of action would be for the students. She sighs, acknowledging that she and Miss Weaver do not necessarily see eye-to-eye on the best way to proceed with dividing the students. She shares with me that Miss Weaver may be reassigned to a different grade next year, but how they are both fighting to stay together—they currently are arguing

their case to Ms. Carmille for the moment. Miss Thorton explains how continuity among teachers within the same grade can go a long way, and that when both teachers are on the same page, how beneficial it can be for the students.

Miss Thorton continues explaining to me the benefits of two teachers being in sync with one another, arguing for example that they can more effectively relay the message to students that neither group should “compete” with one another, but rather, help each other and cooperate. Miss Thorton elaborates, “Like, take Mary and I for example, sometimes I will teach *her* kids, and sometimes she will teach *mine*, like we will do when we get back form Spring Break. Mary is really good at teaching chemistry, while I don’t really know what I am doing, and I am like, ‘Just give me water and weather!’ because that is what *I* am good at. That’s how it *should* be”.

Miss Thorton tells me that little can be done in terms of telling students how to think about their own group placement relative to another student’s placement, but as teachers, they can certainly try to do their best to “nip it in the bud”. Miss Thorton tells me that she tells her students the reason they are with her is because they “All mesh well with my personality. I tell them this just so they don’t think its because they are *better* or *smarter* than the other class”. While this may be helpful, I know that most students in Miss Thorton’s class *do*

> tend to think of themselves as smarter, and sometimes make fun of the students in Miss Weaver's class. Miss Thorton adds that Miss Weaver's students are in the group they are in mostly because of the difficulties they have with reading and writing, noting that she would like to work with these students as well.
>
> Miss Thorton has been the teacher of the high-functioning group of students for three years in a row now, even telling me that Ms. Carmille "Just sees me as a teacher for 'advanced' students, she would not want to move me; this is what she told me. I did not know if I should be offended, I mean, does she think that I could *only* teach *gifted* students successfully? Other teachers here were jealous of me that I got to have the 'high-functioning' group, as if it is easier". I asked her if she thinks there is some sort of social hierarchy at work whereby the teachers attain more prestige if they are assigned to teach the "advanced" students. She confirmed that this is true, nodding her head up and down demonstratively, with pursed lips. (fieldnotes, March 19, 2014)

In the selection above, what stands out most regarding Miss Thorton's thoughts about the practice of tracking is that she is *conflicted*. Admittedly, when asked, she did not know whether tracking is a good or bad thing.

On the one hand, Miss Thorton claims that, if it were up to her, she would not "level" the two classrooms, meaning, to track them by placing the

students on different “levels” of instruction. In many ways, she is aware of the rather negative consequences that dividing students in such a way can have on their perceptions of self as capable and intelligent learners; these sentiments are evidenced when she told her students that the reason they are with her is because they “All mesh well with my personality. I tell them this just so they don’t think its because they are *better* or *smarter* than the other class”.

On the other hand, Miss Thorton also attempts to *justify* tracking, in such a way that suggests that the concept of *difference* does not need to be hierarchical and/or qualitative, but rather, neutral. When I relayed to her Elena’s concerns about being in the “dumb” group, Miss Thorton retorted, “These students are no better than the other students, it’s just that they learn *differently*…You know, like, *Mary’s* students are doing colonies reports and *we’re* not; it’s just *different*.”

In the end, her own struggle and internal oscillation with the merits of tracking goes unresolved; Miss Thorton does indeed see both sides of the proverbial coin. Miss Thorton’s own mechanism for dealing with this particular brand of cognitive dissonance on a daily basis is to understand herself, the teacher, as a buffer of sorts against the ill effects of this practice. When she reflected upon her own incorrect placement within the “slower” math classes as an adolescent student, she was quick to chalk it up to the fact that she simply had a “bad” teacher. She undoubtedly sees herself as a “good”

teacher, but perhaps even more telling about her own perceptions is that she understands herself as having overcome her low placement (e.g., “Look at me *now*” she argued triumphantly), the implication being that if *she* can overcome the potentially debilitative consequences of being placed in the “low” tracks, that by logical extension, *anyone* can as well. As the teacher of the low-functioning group at Amblen, Miss Weaver understands this dynamic quite differently.

(3.6.6.2.) Miss Weaver

The following selection captures a brief, yet highly significant, moment wherein Miss Weaver addressed her class after being let down by them during a late-February session of “science time”. The students were to memorize the lyrics of a circulatory system rap song from YouTube, but when they demonstrated that they failed to do so adequately, Miss Weaver intentionally compared the actions and abilities of Miss Thorton’s students with those of her own students, mainly as a strategy in hopes of motivating her students to achieve more:

> Miss Weaver transitions to “science time”, and queues up a heart/circulatory system rap from YouTube, which she projects onto the large flat-screen classroom TV (see http://www.youtube.com/watch?v=LqhvmUEdOYY). Once the song begins, many of the students smile and begin to gyrate in their seats;

some bob their heads up and down while others wave their arms rhythmically in sync with the beat of the song.

During the rap, Miss Thorton enters the classroom for a brief moment while passing by from outside. She sticks her head into Miss Weaver's classroom and recites one of the lines of the rap and then exits just as quickly. Both Miss Weaver and Miss Thorton smiling knowing smiles to one another.

After the rap video ends, Miss Weaver provides some brief instructions for what the class is about to do next, yet roughly half of the room is in conversation. She pauses, waits with an impatient look on her face and slowly, as students begin to notice her, the room grows steadily more quiet with each passing second. As is customary in Miss Weaver's classroom, the students place one index finger over their lips (i.e., making the "Sshh" motion), while they stick their other arm straight up in to the air, completely perpendicular to the ground. This action lets Miss Weaver know that these students are ready to listen to her. Miss Weaver then assigns "table points" to several clusters of students. She awards each cluster of students one table point, as tallied for all to see on the whiteboard, for having everyone at their table demonstrate that they are ready to listen to her.

In a somewhat frustrated tone Miss Weaver asks, "OK, are we going to have to do 'quiet work' individually, or, can we do a *project*?"

> This is a rhetorical question. “Project!” one third of the class screams. Then, in a decidedly more happy tone—to which the students pick up on and eagerly await the communication—Miss Weaver announces, “Before we begin, I have a short story to tell you all”. The students fidget in the seats with anticipation and smiles. She continues, her smile slowly fading near the corners of her mouth, “This, is a story about a young teacher teaching her students about the circulatory system rap. Just next door, there was also another young teacher who was also teaching *her* students about the circulatory system rap. Well, only two students from the first teacher’s class memorized the rap, while *every* single student from the other teacher’s room memorized the rap.”
>
> If it was not already clear, it has been now made entirely clear to every student in the room that Miss Weaver is referring not to some imaginary young teacher in her “short story”, but rather to *herself*. Miss Weaver continues, no longer smiling at all, “Now which class do you think was embarrassed? Its so much better if we *all* get into it. I know there are a lot of words, but…” (fieldnotes, February 27, 2014)

In the above passage, Miss Weaver referred to the fact that each class was to memorize the circulatory system rap so that at some point they could have a “rap-off” with Miss Thorton’s class to see which class could perform the rap better. When Miss Weaver rhetorically asked her class, “Now which class do

you think was embarrassed?" I could see humiliation in their eyes of the students. Intentionally comparing this group of students to the students next door in Miss Thorton's room—whom most of Miss Weaver's students regard as "smarter" and more capable students—did not render the impact Miss Weaver intended it to; if anything at all, it only further reinforced her students perceptions of self as *less* capable, *less* smart.

Given this apparent lapse in pedagogical judgment, I did not expect Miss Weaver to actively point out her students' shortcomings as a motivational technique, specifically, in voicing that *all* of Miss Thorton's students were able to memorize the lyrics of this rap, while *only two* of her students were able to memorize the lyrics as well. If both Miss Thorton and Miss Weaver are aware of what is at stake in terms of their students' self-perceptions—stemming from which group of students is thought to be "smarter"—why even carve spaces for this type of competition between them?

Indeed, Miss Weaver *did* consider this competition to be a form of encouragement for her students, in that by seeing their peers next door succeed, they too would want to succeed at their level in turn. On the other hand, they may have been another ulterior motive at work: Miss Weaver is a competitive person (having played various sports at the collegiate level), and as such, she may have been potentially blinded by her own competitive desires. In other words, her students—whether she is consciously aware of

this or not—are an extension of her, and how well they do, or how they do *not* do, she may interpret as a direct result of her abilities, or *lack* of abilities respectively, as a teacher to prepare them well. Perhaps on some level, Miss Weaver experienced a desire to "beat" Miss Thorton and her students, effectively demonstrating her own positive influence as a teacher.

This final selection captures an informal one-on-one conversation with Miss Weaver about tracking, but mainly about her own difficulties in being the teacher of the group of students whom most expect *less* of and from. As this passage will capture, Miss Weaver details her struggles during the school year, especially in relation to the "impossible expectations" that are placed upon teachers. This mid-February dialogue between Miss Weaver and I took place after she had plenty of time to reflect on her own experiences with her group of students, as well as her role as the low-functioning teacher:

> Once I started to get to know the kids, and their different abilities, and then I realized where they were, and where I was expected to get them, I was like, 'There's no way, there's just *no* way', you know? I mean, these kids came in *so* underprepared, and now I am expected to get them to all be proficient at levels that they are probably several years away from attaining; its like they are *always* going to be behind. There was a point when I was like, 'I can't do this. How am I going to do this?' I reached out to their fourth grade teacher and asked her how I was supposed to get these kids to the level they are supposed to get

to, and she told me very matter-of-factly, ‘You’re not’. I was shocked. That’s when I realized, you know, forget what I am *supposed* to do, because I would just be spinning my wheels, and the kids wouldn’t get anywhere from it. They need to go step-by-step, they can’t just learn things that are way too advanced for them right now, its just going to put them even further behind, if I try to force them to learn things that they aren’t prepared for. Plus, our classes are different, like, [Miss Thorton’s] and mine. These kids, their self-esteem has been destroyed, you know, because they found out last year that they were going to be in the ‘dumb group’. Their previous teacher (i.e., their fourth grade teacher) told them that they were.”

I am understandably shocked when hearing this information, and in a state of almost disbelief, I ask Miss Weaver to tell me more about it. “Yeah, she (i.e., her students’ fourth grade teacher) means really well, you know, I mean, she teaches at a seventh grade level, but they are in fourth grade, she wants them to do well, but she did not provide for them any positive reinforcement. She told them that she didn’t expect as much out of them as of the ‘other’ group of students. She is no longer with the school”.

I report that I am not surprised to hear that this particular teacher is no longer with Amblen. Miss Weaver nods slowly while looking off into the distance. She continues, “And now, the high-

> functioning group knows that they are the *smart* group, and this plays out in other areas of the school. They feel and act a little superior to my kids, on the playground and at lunch. And my group, they have just been so defeated, because they have been told for so long that no one expects much from them. So I just try to do what I can, even if it goes against what they are supposed to be learning for the day, just so I can provide for them some encouragement, because I feel like that is more important for them". (fieldnotes, February 20, 2014)

No other dialogue I have had with either teacher captures the raw and unadulterated sentiments of the truly debilitative consequences of tracking (not only for the students but for the teachers as well) quite as well as the one transcribed above. Miss Weaver's frustrations are not unique; she articulates so well how seemingly "impossible" it is to be held to the same state-sanctioned standards (i.e., to get every one of her students to score above the "proficient" mark on the series of standardized examinations that *all* fifth grade students are subjected to in the Spring) as Miss Thorton's students, when not only have Miss Weaver's students suffered the hardship of having been stripped of their self-esteem as learners, but equally so, they have not even received the same opportunities to succeed on such examinations.

In this way, this trend captures the devastating *longitudinal* consequences tracking can have on those students placed within the low groups. Tracking has the potential to all but lock students into cycles of *over-*

or *under*achievement. As I asked Miss Thorton, rhetorically, “Is it any wonder why *some* students end up going to college, while others do not, or, maybe some *do* go but then only to drop out a few semesters later? I feel like we are setting them up for failure at such a young age that it becomes increasingly difficult for them to break free from this cycle as they grow older”.

When our classrooms are tracked, the state’s expectations regarding what “proficiency level” students of a certain grade should achieve—as implicated and measured by a standardized examination—are utterly incongruous with what students can actually achieve *if* they have not been provided with an equal opportunity (i.e., access to high-quality and rigorously challenging curricula, adequate preparation, etc.) to succeed. In this way, our schools have consistently failed the students of the low tracks.

When Miss Weaver learned from a fourth-grade teacher that she was not *really* expected to get *her* group of students to the level that the state set forth, in conjunction with the pervasive lack of self-esteem she noted in her students—no doubt in part from individuals such as their previous teacher telling them that they are the “dumb group” and that they were not expected to do as well as the “other” group of students—Miss Weaver chose to employ a triage type of strategy. Again, in Miss Weaver’s own words, “I just try to do what I can, even if it goes against what they are supposed to be learning for the day, just so I can provide for them some encouragement, because I feel

like that is more important for them". No doubt Miss Weaver employs this strategy because she feels like her students "are *always* going to be behind".

3.7. Primary Research Methods

(3.7.1.) Participant Observation

I engaged in participant observation throughout the entirety of my fieldwork (Cammarota, 2004; Emmison, 2004; Gusterson, 1997; Spradley, 1979, 1980). My approach was mostly that of a "participant observer" (Bernard, 2011), however my role within the classrooms fluctuated throughout the school year.

As part of being a participant observer in the classrooms, I recorded observations, when possible, in the form of notebook "jottings", or brief details about key aspects of observed events, interactions, and scenes as they took place (Emerson et al., 2011). Later that same day, I produced full write-ups, translating my jottings into ethnographic fieldnotes by adding details I may have been unable to elaborate upon during the time of initial recording, ultimately striving to recreate full and rich accounts of the events, interactions, and scenes I observed that day (Emerson et al., 2011). These fieldnotes served as a primary qualitative data source, which I later scrutinized and coded for emerging concepts and themes, or in other words, as a way to discern emerging social patterns—including expectations, norms, and rules—

in both classrooms (Buckley & Waring, 2009; Charmaz, 2006; Grbich, 2007; Strauss & Corbin, 1998; Taber, 2000).

Participant observation not only provided me the opportunity to record a wealth of information about students' experiences in school science, but my daily presence allowed me to build rapport with the students and the teachers alike (Bernard, 2011; Young Jr., 2004). Establishing these connections and relationships also helped to facilitate a more comfortable interview environment, allowing students to share more openly and honestly about their unique experiences and perspectives (Young Jr., 2004) about school science and beyond during the individual student interviews during (P_2) and (P_3) (see below for further details).

Participant observation was a central method I employed throughout the research enterprise, and as an iterative approach, it allowed me to properly contextualize future analyses, findings, and conclusions. Piecing together the ways in which school experience, differing perceptions of school success, and school science identify performances are interconnected demanded a detailed accounting of the norms and practices of each classroom (Hatt, 2011). Throughout (P_1), I relied heavily on participant observation to help me to identify and describe the norms and practices of each classroom (Brown, 2004). Doing so helped me to develop nuanced understandings of how concepts such as "science", "being scientific", and "success" are defined and distributed across both classrooms (Archer et al.,

2010; Syh-Jong, 2007; Walls, 2012). In addition, I sought to answer the following questions with the help of participant observation:

- "What are the privileged and marginalized ways of being scientific?"
- "What constitutes being a 'smart' science student?"
- "Does every student get the opportunity to perform as a smart science student?"
- "What constitutes science competency?"
- "Is every student held equally responsible for being competent?"
- "What is the role of language in mediating students' successes and failures in school science?"
- "How, and why, might students and teachers have different perceptions about what counts as a successful outcome in school science?"
- "Is there a relationship between good behavior and being a good student?"

During moments that required greater participation than observation, I fulfilled the duties of a teacher's assistant, including helping instructors prepare materials for lessons as well as assisting individual students or small groups of students during classroom activities. The following example illustrates the ways in which I would typically participate in assisting students with their classroom activities while also recording observations about the everyday

moments of school life; this example captures some of the detail I was able to record in my fieldnotes on a daily basis:

> During the second week of school, when Miss Thorton's class was learning about precipitation and the water cycle, she hands out a tan-colored worksheet to every student, and hands me one as well, titled "Precipitation Research". Each table group is assigned a particular precipitation type (e.g., rain, snow, sleet, or hail). Their assignment is to research their precipitation type on the Internet and then fill out the worksheet in front of them, citing their sources. Miss Thorton reminds her students about how to use Wikipedia; she asks the class, "Is Wikipedia good for information?" Many of the students reply "No". "What is it good for?" she asks, to which she gets the following answers out of a few of the students (all boys): "For resources and for pictures". "Very good", she replies. The worksheet asks students to:
>
> 1. Define your Precipitation Type
> 2. When does this type of Precipitation occur?
> 3. What states does this happen MOST often in?
> 4. Any other interesting facts?
> 5. Draw an image:
> 6. Websites used:
>
> Miss Thorton then distributes iPads to each table, with Wi-Fi capability, so that the students may conduct their research. I

immediately note the students' excitement in being able to use the iPads. I decide to travel from group to group, asking if I can help out with their research. One table group (consisting of Patricia, Maggie, Felix, and Gamaliel) is assigned "Rain". One of the boys in the group is the first to handle the iPad, with all of the other three students excitedly looking on. He opens the Safari Internet application, and types "definition of rain". The group agrees to use the Bing dictionary definition for rain, which they paraphrase as "Water that falls from the atmosphere". They ask me if this is OK, and I tell them that it is. The group moves on to question two, "When does this type of Precipitation occur?", and after several Internet searches, they fail to find what they need. I try to help out, but experience difficulty of my own. Maggie, a diligent student, yet mild-mannered and quiet girl, grows anxious and expresses worriedly "We are behind the other groups". I tell her that it is OK and for the group to try to find information from a particular weather website, which explains that precipitation mostly occurs in the winter months. Each of the four students record this information as well as the website that produced it on their worksheets. (fieldnotes, September 10, 2013)

During moments of greater observation than participation (e.g., teacher lectures or reviews, etc.), I would sit amongst the students of the classroom, changing seats or vantage points every other day to experience the full space of the classroom from every angle, in other words, to see the classroom as *every* student in the room sees it. Additionally, since the students of each classroom sat in the same assigned seats every day (as a part of their broader group assignments), changing where I would sit every other day ensured that I was as close as possible to *all* of the students, allowing me to make better observations of their behavior and interactions during class, capturing subtleties such as communication between two neighboring students, which would not be possible to decipher from the peripheries of the classroom.

While recording classroom observations, I was especially attentive to students' actions, behaviors, responses to teachers and lesson plans, teacher expectations, and the like (Arnold, 2010; Brown, 2004). I was also especially attentive to students' discursive practices in the classrooms (Arnold, 2010; Brown, 2004; Bucholtz, 2011; Martin-Beltrán, 2010; Wei, 2011). In other words, I was able to key-in on students' "youth speak" (Calabrese Barton & Tan, 2010), or symbolic youth-centered language, as well as their use of code-switching (i.e., the moving back and forth between English and Spanish) to pursue goals within linguistic interactions (Bernard & Ryan, 2010).

Ultimately, because of the in-depth nature of this approach, participant observation provided me with an “intuitive understanding” (Bernard, 2011, p. 266) of the sociocultural milieu of the classrooms I explored.

(3.7.2.) Interviews

All interviews were conducted individually and took place during scheduled school hours, sometimes during students’ lunch break, recess periods, or otherwise during moments of “free instruction”, when teachers would allow students to read a classroom-approved book of their own choosing in between more structured lessons. Interviews were conducted outside on benches next to the school playground (about 150 feet from the fifth grade classrooms), where and when others could not overhear students’ responses to questions in an effort to ensure the confidentiality of their responses.

Each consenting participant was asked to participate in a total of two individual audio-recorded interviews, each lasting no longer than an average of 45 minutes. Additionally, I was sure to remind students that the answers they provided me will never be able to be traced back to them, and, that there are no "right" or "wrong" answers to the questions I asked them. The latter consideration was a concentrated effort on my part to avoid any unwanted stress that may have arisen from students thinking they might be "tested" in any way.

(3.7.2.1.) "Being a Science Student"

These individual interviews were semi-structured and consisted of a series of open-ended questions (May, 2001), whereby students were encouraged to provide any additional information they wished. By "semi-structured" (Clarke & Agyeman, 2011; Lamont & White, 2005; Rickinson, 2001; Walls, 2012), I mean that I had a prescribed set of questions that I asked each student, yet students were encouraged to mention topics and items of interest to them—ones they felt may be pertinent to the interview—and when they did so, I took the opportunity to explore students' perspectives.

I began each of these interviews by asking students some basic questions about their experiences in school and particularly in the fifth grade (e.g., challenges, favorite moments, etc.), to get to know each of their unique perceptions of their experiences a bit better. I also asked students questions about themselves, including their future aspirations for college, as well as both their anticipated *and* desired future profession/s. I also asked students to provide for me perceptions of their individual abilities and attributes with special regard to whether or not they felt that the future they envision for themselves is accessible and/or achievable, as well as the extent to which science factors into their future plans, if at all (Archer et al., 2012; Riegle-Crumb et al., 2011). In these regards, I asked students to answer the following questions:

- Do you want to go to college someday?

- Why or why not do you want to go to college?
- What would you like to study in college, and why?
- Where would you like to go to college?
- Do you think you have a good, not so good, or in the middle chance of going to college, and why?
- What kind of job would you like to have when you are older, and why?
- Does the job you want to have use science? If so, how?
- What is your favorite subject in school, and why?
- What is your least favorite subject in school, and why?
- What is your best subject in school, and why?
- What is the subject that you have the most difficulty in, and why?
- From the very beginning of the school day, to the very end of the school day, what is your favorite part about being in, or coming to, school, and why?
- From the very beginning of the school day, to the very end of the school day, what is your least favorite part about being in, or coming to, school, and why?

I then asked students questions that correspond to three mutually reinforcing and interconnected dimensions of school science experience and identity enactment (as informed by both my preliminary findings throughout participant observation during [P_1] as well as the theoretical literature): *competence*, *performance*, and *recognition* (Carlone & Johnson, 2007).

Competence refers to developing an epistemological stance toward science, including how scientific knowledge is constructed, where it originates, what it is used for (Walls, 2012), as well as being motivated to understand the world in this way (Archer et al., 2010). To gather data on this dimension, I presented the following hypothetical scenario to students, thereafter asking them the following sorts of open-ended questions:

- Imagine you meet someone from another planet, and they tell you that they can read some of our words, but that they have no idea what they mean. If this person came up to you and asked, “What is ‘science’?” What would you say?
- If this person then asked you, “Who are scientists, and what do they do?” What would you say?
- Finally, if this person said, “It seems like you humans use science on you planet, but I’m not sure how, or for what. What do you use science for?” What would you say?
- Do you like science? Why or why not?

Performance refers to the ways of speaking, writing, as well as interacting with others and with tools (e.g., measuring and recording devices, textbooks, etc.) in ways promoted by the social space of the classroom (Kane, 2012; Varelas et al., 2011), and in different ways depending on which classroom a student has been assigned. *Performance* also refers to one’s practices (e.g., behaviors, language use, style of dress, etc.), which can come to serve as

indicators of ability and competence, evaluated not only by teachers but within peer groups as well (Gresalfi et al., 2009; Lareau & Weininger, 2003). To gather data on this dimension, I gathered students' perceptions of what it *means* to be a science student (i.e., to act, behave, talk, think, etc., like a science student) in the high-functioning group versus the low-functioning group (Carlone et al., 2011; Shanahan & Nieswandt, 2011). I also wanted to understand students' experiences *as* science students in these two different spaces. To gather data on this dimension, I asked students to answer the following open-ended questions:

- What do your teachers expect of you when you are leaning about, or doing, science?
- Do you think your teachers have similar or different expectations of you when you are leaning about subjects other than science? If so, how?
- Is there anything special about science students—things they do or say, or the way they act, behave, look, or speak—that is different from any other kind of student (for example, history students or math students)?

Recognition refers to the degree of acknowledgement one receives from meaningful others (e.g., classmates, peers, teachers, etc.) (Carlone & Johnson, 2007)—as well as the degree of acknowledgement one assigns oneself—as an accepted and legitimate participant within the sociocultural

world of their classroom. To gather data on this dimension, I asked students to answer the following open-ended questions:

- Are you good at science? Why or why not?
- Do you think your classmates think you are good at science? Why or why not?
- Do you think your family thinks you are good at science? Why or why not?
- Do you have friends that do not go to school here? If so, do you think that your friends that do not go to school here think you are good at science? Why or why not?
- Do you think your teachers think you are good at science? Why or why not?
- Do you think you are smart? Why or why not?
- Is there anything that smart people typically do, say, think, or wear?
- What makes a smart person “smart”?
- How can you tell if a person is smart?
- Can you tell if a person is smart even if you do not know them, that is, can you tell if a person is smart just by the way they act, behave, dress, or speak? If so, how?
- Who do you think are the three best science students in your class? You may include yourself if you think that you are one of the three best science students in your class.

- What do the three best science students in your class share, or have in common, that makes them the best?
- In what ways are you similar to the three best science students in your class?
- In what ways are you different from the three best science students in your class?
- Who do you think are the three students in your class that have the most difficulty with science? You may include yourself if you think that you are one of these students.
- What do these three students in your class share, or have in common, that makes them have difficulty with science?
- In what ways are you similar to these three students in your class?
- In what ways are you different from these three students in your class?

It is important to understand how students construct perceptions of the “best” or the “smartest” science students in class—and to what extent these perceptions are shared—as the answers to these questions carry potential to uncover patterns regarding students perceptions (as constructed through their experiences and through the expectations of themselves and of others) of who they think they must be, or be like, in order to succeed in school science (Brickhouse & Potter, 2001).

In addition to the dimensions of *competence*, *performance*, and *recognition* discussed above, I also asked students directly about the two fifth-grade classrooms. The questions speak for themselves:

- There are two classrooms in the fifth grade. Do you think these classrooms are more similar to one another or more different, and why?
- Do these two classrooms learn different things or at different speeds?
- Are the expectations of the students in one classroom different from the expectation of the students in the other classroom, and if so, how?
- Do you think that one classroom is smarter than the other classroom? If so, which one, and why do you think so?
- Do students talk about the two classrooms being different in any way, and if so, what kinds of things do they say?
- If you think that the two classroom are different in any way, do you think that it is a good thing or a bad thing, and why?
- Do you think that some students think that they are smart *because* they are in Miss Thorton's class? If so, who are these students?
- Do you think that some students think that they are not as smart *because* they are in Miss Weaver's class? If so, who are these students?

- Do you think that some students should be in Miss Thorton's class instead of Miss Weaver's class? If so, who are these students, and why do you think so?
- Do you think that some students should be in Miss Weaver's class instead of Miss Thorton's class? If so, who are these students, and why do you think so?

(3.7.2.2.) "Draw a Science Person" (DASP)

"Draw a Scientist Tests" (DAST) have been employed for decades to understand youth's perceptions of scientists (Medina-Jerez, Middleton, and Orihuela-Rabaza, 2011; Walls, 2012). The results of these studies—across grade-level, socioeconomic status, gender, ethnicity, and nationality—report that students' illustrations most often depict stereotypical representations of scientists (i.e., as older white males wearing white lab coats) (Ruiz-Mallén & Escalas, 2012; Walls, 2012). The results are unsurprising as these kinds of stereotypical representations are widely disseminated in media and in popular culture, and even in many science textbooks as well.

(DAST) have also been used to gain insight into the extent to which diverse groups of students affiliate, or do not affiliate, with science as a potential profession. For underrepresented minority students, students' illustrations have been interpreted to reflect little identification with science as a potentially accessible, achievable, and/or appropriate profession—as

inferred by their illustrations of individuals with whom they share little if any cultural, gendered, or ethnic/racial characteristics (Losh et al., 2008).

A recognized limitation of many previous (DAST) studies is that students have been asked to draw pictures of *only* scientists, leaving unexamined many other individuals within society that engage science (Losh et al., 2008). In my own reiteration of the (DAST) method, I assessed not only students' perceptions of scientists, but I did so as a starting point to explore how students see themselves in relation to science teachers, college science students, various other careers that engage science, and as a potential career path (Archer et al., 2012; Calabrese Barton et al., 2013). To do so, I expanded the (DAST) method by asking students not only to draw a scientist, but to draw a science teacher, a science professional, and a college science student as well. In asking students to draw science teachers, I anticipated uncovering gendered stereotypes concerning students' expectations of *doing* science as a masculine activity (i.e., by drawing *male* scientists), and *teaching* science as feminine activity (i.e., by drawing *female* science teachers) (Weinstein, 2008).

Additionally, because college admission is actively promoted as a worthwhile future goal in both classrooms, it was crucial to ask students to draw what they perceived a college science student to be. I reasoned that the degree to which students perceived sharing attributes and/or characteristics, between themselves and the individuals in their drawings, would point to how

accessible, achievable, and appropriate they believed futures with and/or in science to be (Archer et al., 2012; Riegle-Crumb et al., 2011). I refer to my approach as the “Draw a Science Person” (DASP) method.

Each round of (DASP) interviews was divided into a drawing phase (i.e., when students were asked to produce only illustrations), and then later, a separate semi-structured interview phase in which students were asked to answer a series of open-ended questions about their illustrations (Walls, 2012). While students were asked to produce two total sets of drawings (once during [P_2] and once again during [P_3]), consenting students each participated in only one full interview regarding their drawings.

During the drawing phase, I provided every student in each respective classroom—each classroom participated in this activity on the same day but at different times—with one blank sheet of white paper and an assortment of Crayons, colored pencils, markers, and other various drawing instruments. I asked the students to divide their blank sheets of paper into four equally spaced portions, and then to draw the following four illustrations: Scientist, science teacher, science professional, and college science student. I asked students that they make their drawings as realistic as possible, instructing them *not* to draw a scientist with rainbow-colored skin, for instance, because no one has rainbow-colored skin.

For the *scientist* and the *college science student* illustrations, I provided no further instructions for the students in how to compose their

illustrations; I sought to capture their unadulterated perceptions of each type of person in their illustrations (Medina-Jerez et al., 2011).

For the *science teacher* illustration, I asked students *not* to draw their current, or previous, science teacher/s. And, before students were instructed to produce the fourth illustration, I asked each student to think of a career or job that requires the regular use and/or knowledge of science, other than a scientist, a science teacher, or a college science student. Students' individual responses to this request then served as the basis for each of their *science professional* illustrations.

While many studies employing (DAST) have analyzed students' illustrations as the *primary* source of data, I believe this misses critical opportunities to explore with students the reasons for crafting their illustrations in the ways they did (Walls, 2012). Attending solely to the illustrations also misses opportunities to explore with students what their illustrations mean to them, especially with regard to any perceived differences and/or similarities between the individuals depicted in their illustrations and their own perceptions of self (Christidou et al., 2010; Ruiz-Mallén & Escalas, 2012).

After students completed their illustrations, I conducted in-depth interviews with each consenting student, asking them to answer a series of open-ended questions about each of their four illustrations (Kim, 2011; Shanahan & Nieswandt, 2011; Walls, 2012). Interviews moved from one

drawing to the next, addressing each separately and in-turn. I asked students to describe their illustrations, allowing them the opportunity to express what they felt was important for me to know about them (Kane, 2012; Varelas et al., 2011). I then asked students to answer the following questions in order:

- Please describe your drawing to me.
- What is this person doing in your drawing and why are they doing that?
- How old is this person?
- Is this person male or female?
- What is this person's skin color?
- What is this person's name?
- What are this person's hobbies, interests, or things they like to do for fun?
- Describe this person's family, if they have one.
- Who is in this person's family, and what do they do for work?
- Describe this person's personality.
- What are the things, if any, that this person would not do?

After the above questions had been asked for each one of the four drawings, I then asked:

- Of these four people, who are you most similar to, and why?
- Of these four people, who are you most dissimilar to, and why?
- What are your own hobbies, interests, or things you like to do for fun?
- Please describe your own personality.

- Please describe your own family.
- Who is in your family, and if you know, what do they do for work?

(3.7.3.) "Being a 'Good' Science Student"

To individuals, social structure is experienced through the *expectations* and reactions of others, which then guide and constrain behavior and actions (Shanahan & Nieswandt, 2011). I reasoned that capturing students' shared understandings of the expectations of "good" science students using free-lists and rank-order exercises—if indeed, these understandings were truly *shared*—would provide evidence of the different social structure/s within each classroom (Brewer, Garrett, & Rinaldi, 2002; Ross & Medin, 2005; Ryan et al., 2000; Thompson & Juan, 2006).

In attempting to gather data that directly spoke to central research question (b) (i.e., how students' negotiate the concept of "success" in school science), I chose the adjective "good" as a generally positive label that implies *success*, instead of explicitly saying "success", as it may have been too closely associated with strict academic achievement (i.e., grades) in students' perceptions, thereby potentially overlooking the myriad of other ways in which students can be "good" (Kane, 2012). Rather, when asking students about the expectations placed upon good science students, I believed this descriptor was comprehensible and broad enough for fifth-grade students to elicit a

variety of responses beyond those referring only to good grades (Carlone et al., 2011; Kane, 2012; Oyserman et al., 2007).

My approach in gathering this data was identical in each classroom. I conducted this exercise with each classroom twice (once during [P_2] and again during [P_3]). Each time, I passed out one sheet of blank white paper to every student, and standing at the front of the room, I addressed them as follows:

> Close your eyes. I will close my eyes too. Now, I want you to picture a really good science student. What does this person *look* like? What do they *sound* like? And, what do they *act* like? This could be someone you know, but it doesn't have to be. I want you to think about how you would describe this person. When you open your eyes, I want you to write down as many words as you can think of to describe this person.

Additionally, I wrote on the white board the following: "Good science students in (Miss Thorton's/Miss Weaver's class [respectively, depending on which classroom I was addressing at the time]) are expected to _____". I told students to write down as many words and/or phrases as they could think of to fill in the blank.

I anticipated finding that the expectations of good science students would be conceived in terms of both actions (i.e., what good science students *do*) and attributes (i.e., who good science students *are*) (Shanahan & Nieswandt, 2011).

After I compiled all of the free-lists from each student, I "cleaned" the data (Bernard, 2011), by collapsing responses—for example—such as "intelligent" and "smart" into a single item type, as the intended meanings behind them are roughly equivalent. I then generated two master-lists (one per classroom) containing the different items listed by each student, which I then subjected to a frequency analysis, whereby the frequency with which an item was listed served as an indicator of its importance/relevance (Grbich, 2007). In other words, I assumed that the more frequently a given word was cited, the more important/relevant it was for the students to include in their lists.

I then chose a set of items for further study (i.e., those that occurred with greatest frequency, representing the cultural domain, or collective social understanding of each classroom). To determine how many items represented the cultural domain (Handwerker, 2001; Johnson & Weller, 2002) within each classroom, I selected items that were listed by at least 15% (Bernard, 2011) of the students (~five students) from each respective classroom.

For each class, I passed out a printed sheet with their most frequently cited expectations—shuffled and randomly ordered as a safeguard against "order effects" (Bernard, 2011, p. 237)—presented as a list down the left-hand column of the page. Next to each listed expectation, I placed a "(_)" symbol

for the students to provide their respective ranking. The directions at the top of the page read as follows:

> Please rank the following terms below from most important to least important. Put a “1” next to what you think is the most important expectation of a “good” science student. Then, put a “2” next to the second most important expectation, and so on, until you have assigned a different number to every expectation below.

After I collected the rank-order data from each student, I created two tables in Microsoft Excel (one for each classroom) that plot each student against the respective rankings of expectations. For each expectation, I generated statistical measures including mean, median, mode, and standard deviation, which allowed me to assess the extent to which individual students were highly and positively correlated to one another (if at all)—*within* each classroom—with regard to their individual rank-orderings (Ross & Medin, 2005; Ryan et al., 2000). These metrics allowed me to determine the most important/relevant expectations of good science students within each classroom, by measuring the expectations that received the lowest average scores, because the lower the number assigned by students to any expectation, the more important they thought it to be. Importantly, I was then able to compare the most important expectations of good science students between the two classrooms in an effort to determine if they were in fact qualitatively different form one another.

I anticipated finding that students in the low-functioning group—more so than the students in the high-functioning group—would understand themselves, and others, as good science students based on behavioral ideals established within each classroom as well as performed levels of English proficiency.

3.8. Data Analysis

As stated above, my approach to data analysis rounded out the final component of my research design. To help establish case-based comparisons—as the articulation of my central research questions warranted—I employed a constructivist grounded theory approach to analyze the data collected throughout the course of the research enterprise (Charmaz, 2000, 2002, 2006; Emerson et al., 2011).

Due to the iterative nature of a constructivist grounded theory approach, the processes of data collection were quite inseparable from those of data analysis, and indeed both occurred in concert throughout the course of the research (Bernard & Ryan, 2010; Emerson et al., 2011; Taber, 2000). Recognizing that analysis pervades *all* phases of research, my approach to data analysis was inherently inductive as well as deductive (Emerson et al., 2011).

Indeed, such an approach was not only most appropriate, given the text-heavy nature of my primary data sources, but importantly, it

complimented my theoretical framework for making sense of individual and group experience/s, as well as the nature of individuals' identity claims and performances: Identities are *co*-constructed in that students understand themselves, while they are being understood by others—and in turn students then present these understandings of self—differently within particular social spaces (Kane, 2012). This is indeed the case because my own understanding of students' identity claims and performances must also be co-constructed; it is an intersubjective interpretive engagement created through the interactions between my informants and I (Bernard, 2011; Charmaz, 2006; Emerson et al., 2011; Grbich, 2007; Kane, 2012).

Additionally, a constructivist grounded theory approach was well suited to the idiosyncrasies and nuances that pervaded the students' lived experiences; it was necessary to fully capture the ways in which students navigated the school's, and their classroom's, institutional and social landscapes. I captured these moments by highlighting students' perspectives, thereby giving voice to them throughout the presentation of data (Borrero et al., 2012; Collins, 2013; Quiroz, 2001) in the following chapter, Chapter Four (Central Findings).

In what follows, I outline my analytical approach with regard to the primary forms of data gathered throughout this study, but especially the full ethnographic fieldnotes composed as a result of continual participant

observation, as well as the audio recordings from the *"Being a Science Student"* interviews and the (DASP) interviews.

By the conclusion of my fieldwork, I had obtained data from a variety of sources (see Table 1.8. below), which were auditory, observational, textual, and visual in nature. I conducted a total of 77 interviews (39 "Being a Science Student" Interviews; 37 [DASP] Interviews; and, one additional interview where a boy from Miss Weaver's class, Ramon, interviewed me about topics that were of interest to him) totaling over 30 hours. I also conducted several informal interviews with Miss Thorton, Miss Weaver, and Mr. Benzen throughout the course of the school year.

Individual interviews (aside from the aforementioned interview with Ramon) ranged in length from nine minutes to 45 minutes. Throughout the course of my fieldwork, I produced 618 double-spaced pages (created in Microsoft Word) of ethnographic fieldnotes resulting principally from participant observation in the classrooms. I also obtained dozens of miscellaneous textual materials, including but not limited to: Assignment instructions, copies of letters from teachers that were sent home to parents, school pamphlets, student worksheets on science lessons, and various student doodles and drawings that were given to me by the students. While at Amblen, I also managed to take 185 photographs (taken by myself with my mobile phone camera) of the teachers and of their classrooms the students, and the features of the school itself as well as the surrounding area for

appropriate contextualization. Of course, due to the confidentiality agreements I had made with all research participants during the process of obtaining informed consent, many of these photographs would compromise the students' and/or the school's anonymity, and therefore will not be included in this dissertation, or in any future publications.

Table 1.8. Primary Sources of Data.

Types of Data	Description
Participant observation fieldnotes	618 double-spaced pages in Microsoft Word
Audio recordings	39 "Being a Science Student" interviews (16h53m) 37 "Draw a Science Person" interviews (12h6m) 1 interview of myself by student (1h5m) 1 miscellaneous classroom interview (14m)
Students' illustrations	466 total "Draw a Science Person" drawings
Students' free-lists	115 "Being a 'Good' Science Student" free-lists
Students' rank-orderings	115 "Being a 'Good' Science Student" rank-orderings
Miscellaneous textual materials	Students' drawings and worksheets, school pamphlets
Photographs	185 photos of classrooms/school/students/teachers
Videos	9 video clips of classrooms/students/teachers (16m)

(Source: Grayson Ford Maas Dissertation Research, 2015).

To avoid redundancies, I will not recite my analytical approach toward the free-list and rank-order exercises again here as I did in the preceding section. In the broadest scope, I employed both intra- and intergroup multivariate comparative analyses (Bernard & Ryan, 2010) of all primary data to provide answers to my central research questions.

I treated each classroom as its own ethnographic case study (Merriam, 1998), and I performed identical analyses of the aggregate data collected from both classrooms and then compared the findings within each classroom to establish empirically-based explanations for the similarities and differences between classrooms.

My analytical approach included three central activities: Initial coding and theory building, memo writing and theory building, and consolidating, refining, and composing of polished theory (Bernard, 2011). To assist with the organization and coding of data, I used the mixed-methods data software program MAXQDA (Version 11.141001), in addition to my own organizational efforts through document folders created within my own personal laptop. I also took advantage of a MAXQDA feature that allowed me to code audio recorded as well as visual data (i.e., interviews and photographs) in the same way that I could as textual data, and importantly, MAXQDA was able to treat *all* coded data as one aggregate data set, tabulating for example, the frequency with which a particular code appeared throughout *all* data sources. Alternatively, I was able to retrieve and view any portion (small or large) of any or all data sources when I wanted to key-in on sources of data or their features therein.

During initial coding and theory building, I assigned codes to chunks of text systematically (i.e., line-by-line), while identifying key concepts by breaking up text into distinct conceptual domains (Charmaz, 2002). After

several key concepts emerged, I employed a constant comparative method, in which I began to construct categories by considering how existing, as well as newly emerging, concepts might be related to one another (Strauss & Corbin, 1998; Syh-Jong, 2007). The constant comparative method allowed me to collapse, expand, and create new, broader, even more inclusive categories while continuing to code data (Syh-Jong, 2007). This focused coding approach guided me in conceptually organizing and making sense of data as it was interpreted (Charmaz, 2002).

During memo writing, I produced ongoing and detailed notes, including hypotheses about the relationship between concepts and categories, which occurred throughout the entire coding process (Bernard, 2011; Charmaz, 2002; Strauss & Corbin, 1998). During the composition and refining of theory, I connected emergent theoretical models and built them around a central and inclusive category that held the data together (Bernard & Ryan, 2010). All of these activities did not necessarily occur in distinct temporal phases, but rather iteratively, as coding and memo writing informed theory building, which itself was tested and refined via further coding and analysis throughout the entire research enterprise (Emerson et al., 2011).

Below (see Table 1.9.) is a list of the primary codes that emerged throughout the process of data analysis. Of the codes listed, I often classified/divided codes even further into secondary, tertiary, or even quaternary sub-codes. For example, the code “Language” refers to many

things, including students' code-switching (i.e., moving back-and-forth between English and Spanish and so on), as well as moments of "passing" (i.e., an attempt to display one's fluency in a language and its application at a level that is more advanced than one actually possesses) during reading, speaking, or writing activities in school. Even further, I divided each of these codes into instances when they were expressed in the high-functioning classroom ("HF") as well as the low-functioning classroom ("LF").

Table 1.9. Primary Codes.

Grounded Theory (Deductive)
Ability
Behavior
Citizenship
Embarrassment
Expectations (Teachers)
Family
Friends
Gender
Language
Peer Group
Popularity
Punishment
Responsibilities (Students)
Rewards
Rules
Schoolwork
Science and Scientists
Smartness
Teacher Challenges
Technology
Testing

(Source: Grayson Ford Maas Dissertation Research, 2015).

To successfully carryout a comparative analysis between the two classrooms, I also employed several techniques to locate themes within the texts I analyzed. Such techniques included *repetitions* (i.e., how often actions and behaviors came about in fieldnotes, or, how often students expressed particular attitudes or ideas within interviews), key-words-in-context (KWIC) counts (i.e., the number of times important or unique words were used by students to describe, for instance, their experiences in school, or other interview topics), and word co-occurrence (i.e., when answering interview questions, which words did students commonly pair with other words to describe their ideas?) (Bernard & Ryan, 2010).

I then compared the similarities and differences regarding the types (i.e., which kinds?), number (i.e., how often?), and prevalence/relevance (i.e., how important?) with which themes emerged between classrooms. Undoubtedly, students' experiences in school science are endlessly unique. Despite this variation, however, I did expect to uncover patterns between classrooms regarding: The number and types of opportunities for Latinas/os to succeed in school science, how Latinas/os negotiate the concept of success in school science, and the ways in which Latinas/os claim and perform successful school science identities.

Finally, I employed a constructivist-interpretive perspective in making sense of my analytical outcomes (Denzin & Lincoln, 2003) as well as a critical ethnographic approach in the composition of this dissertation as a final

product of this research enterprise (Calabrese Barton & Tan, 2010; Carspecken, 1996; Dennis Korth, 2007; Emerson et al., 2011; Grbich, 2007). Consistent with grounded theory, both approaches demanded an understanding of the research outcome/s to be inherently *co*-constructed, or in other words, the ranges of research participants' perspectives, as well as those of the researcher, produce these outcomes *together* (Grbich, 2007).

Constructivist-interpretive perspectives seek to explore and demonstrate how individuals interpret their own lived experiences and realities, as this research does (Grbich, 2007; Kane, 2012). By privileging the multiple voices of students, this approach was absolutely necessary for exploring the ways in which Latina/o youth interpret their experiences in school science, and how they come to perceive themselves as competent and/or successful science students (Aikenhead, 2001; Borrero et al., 2012; Calabrese Barton & Tan, 2010; Collins, 2009).

Complementary to a constructivist-interpretive perspective, a critical ethnographic approach demanded a focus on power relations, including for example, questions regarding the ways in which the school's organization and structure shaped students' experiences and opportunities to succeed (Anderson, 1989; Calabrese Barton, 2001; Carspecken, 1996; Motha, 2006; Relaño Pastor, 2011; Staiger, 2004; Villenas & Deyhle, 1999). To quote Wortham (2008, p. 39) again, regarding the language-power dynamic more specifically, if "Educational institutions play central roles in authorizing and

circulating ideologies of language through which ‘educated’ and ‘un-educated’ language use are associated with differentially valued types of people", then how might these practices impact bilingual Latinas/os perceptions of self and their opportunities to succeed in school science? I take immense pride in helping to offer some answers to these timely questions.

4. CHAPTER FOUR: Central Findings

4.1. Introduction

This chapter summarizes the results of the primary methods employed throughout my research design. This includes the free-list and rank-order exercises, which demonstrate how the students experience different sets of expectations—depending on classroom placement—with regard to what it means to be a “good” and/or “smart” science student. While there existed considerable overlap, the students in the low-functioning group—more so than the students in the high-functioning group—understood themselves, and others, as good science students based on behavioral ideals established in the classroom (e.g., being well behaved, not talking back to teachers or during class, being nice and kind to others, etc.).

In this chapter, I also summarize the results of both interview protocols. One interview, “Being a Science Student”, examined the school science experiences of students, as well as the ways in which they understood constructs such as *intelligence* and *success*. I detail how students understood themselves, and their peers, as competent and/or successful science students, differently, depending on classroom placement in which students *learn* to present themselves as “good” and/or “smart” students, differently. Intelligence, and the display of it, is not innate but instead actively *produced* by and through the expectations and reactions of meaningful others. For

example, the students in the low-functioning group were not *expected* to succeed in the same ways, and with the same frequency, as the students in the high-functioning group.

Focusing on the subject of science more specifically, the results of the "Draw a Science Person" (DASP) interview demonstrate the extent to which Latina/o youth affiliate, or do not affiliate, with science as a profession, and especially with regard to science as a potentially accessible, achievable, and/or appropriate profession. I asked students to tell me about the individuals they had drawn (e.g., their families, hobbies, interests, personalities, etc.), and to consider the attributes, characteristics, and qualities they share—or perhaps do not share—with these individuals, by asking them whom they feel they are most similar to—as well as most dissimilar to—and why. I argue that the degree to which students perceive sharing attributes with the figures in their drawings points to how accessible and achievable they believe futures with and/or in science to be.

This chapter highlights the experiences of the students of Amblen as they move through the fifth grade and especially as they engage with the subject of science, not only in each of the two main classrooms but also during their weekly rotations as well. I present each classroom as its own ethnographic case study by describing them as figured worlds, or "Socially and culturally constructed realm[s] of interpretation in which particular characters and actors are recognized, significance is assigned to certain acts,

and particular outcomes are valued over others" (Holland et al., 1998, p. 52). To do so, I include many descriptive details throughout the chapter from the ethnographic fieldnotes I composed as a result of my time spent in the classrooms. I also recapitulate students' general feelings about school (e.g., their most/least favorite subjects, most/least favorite activities of the school day, the challenges and difficulties they face, etc.), and their perceptions about the likelihood of attending college or attaining positions in their careers of choice.

In addition to the academic endeavors that make up a majority of the school day, for both students and teachers alike, students' "behavior"—how it is classified, evaluated, and managed—emerged as a central theme throughout my fieldwork. How students managed their own behavior, and indeed how teachers managed students' behavior, was a chord that pervaded everyday school life. In this chapter, I deconstruct the functional logic of demonstrating "good" versus "bad" behavior, when it is employed, and by whom, all as part of complex strategies that reflect students' varying ideas about school success and how these behavioral enactments are suited to the cultural milieu of each classroom. In doing so, I demonstrate that students are not solely—or even primarily—motivated to achieve *academic* success in school. Students are significantly motivated by, and through, their peer groups and will work to balance success within both domains, while at times achieving success in one domain at the expense of the other. Related to this,

I argue that there was greater peer group recognition and social rewards given for *academic* successes in the high-functioning group than in the low-functioning group.

4.2. "Being a 'Good' Science Student"

(4.2.1.) Introduction

During (P_2) and (P_3), after students had enough exposure to, and participation in, the norms and practices of their respective classrooms—and after I garnered the appropriate contextualization and grounding afforded to me by several months of strict participant observation—I asked students to individually produce free-lists (Ross & Medin, 2005; Ryan, Nolan, & Yoder, 2000; Thompson & Juan, 2006), in other words, to individually record as many expectations of "good" science students as they could think of (Bernard, 2011).

I expected the free-lists generated by the students to reveal central themes (Ryan & Bernard, 2003; Miles & Huberman, 1994) regarding students' shared understandings of who they think they must be, or be like, in order to succeed in school science (Brickhouse & Potter, 2001). Thus, these free-lists were administered expressly with the goal of helping to answer central research question (c), that is, how classroom placement impacts students' abilities to claim are perform successful school science identities.

After I compiled each of the students' free-lists, I selected a set of responses from their collective lists (i.e., those that were cited with the greatest frequency), and then instructed students to individually rank-order the items from most important to least important, in terms of the important expectations of "good" science students. Thus, another purpose of the rank-order exercises was to generate evidence that directly spoke to central research question (b), that is, how students' negotiate the concept of "success" in school science. Overall, I anticipated that while there would be considerable overlap, what it means to be a good science student—and the expectations of them—would be qualitatively and quantitatively different between the two classrooms.

(4.2.2.) Phase Two (P_2)

In Miss Weaver's classroom (i.e., the low-functioning classroom), 30 students produced a total of 248 individual responses (i.e., one response = to list one expectation of "good" science students), for an average of 8.27 responses per student. Of these 248 individual responses, 86 represented unique conceptual items (i.e., items listed at least once or more). Thus, the majority of students' responses were also cited at least once by at least one of their peers. In other words, 162 of the responses listed had been cited by at least two or more students.

In Miss Thorton's classroom (i.e., the high-functioning classroom), 30 students produced a total of 284 individual responses, for an average of 9.5 responses per student. Of these 284 individual responses, 65 represented unique conceptual items. Thus, as in Miss Weaver's classroom, the majority of students' responses were cited at least once by at least one of their peers. In other words, 219 of the responses listed had been cited by at least two or more students.

Miss Thorton's students collectively managed to produce a greater total number of responses (284) than did Miss Weaver's students (248). The students in the high-functioning classroom produced more responses (9.5) per student than did the in the low-functioning classroom (8.27). While it remains difficult to know precisely what these figures mean, what is perhaps more telling is the total number of unique responses per classroom (i.e., any response listed by a student that had been conceptually different from all of the other responses listed by other students within the same classroom).

While Miss Weaver's students produced 86 unique responses, Miss Thorton's students produced only 65 unique responses. What these data point to is the notion that there is a much greater *shared understanding*—a greater internal consistency—among the students of the high-functioning classroom than among the students of the low-functioning classroom regarding the expectations of good science students. The lower the number of unique responses cited within a classroom, the greater the shared

understanding and internal consistency, as the members of the high-functioning classroom tend to cite the same responses as their peers with greater frequency.

After I compiled all of the free-lists from each student, I "cleaned" the data (Bernard, 2011), by collapsing responses—for example—such as "intelligent" and "smart" into a single item type, as the intended meanings behind them are roughly equivalent. I then generated two master-lists (one per classroom) containing the different items listed by each student, which I then subjected to a frequency analysis, whereby the frequency with which an item was listed served as an indicator of its importance/relevance (Grbich, 2007). In other words, I assumed that the more frequently a given word was cited, the more important/relevant it was for the students to include in their lists.

I then chose a set of items for further study (i.e., those that occurred with greatest frequency, representing the cultural domain, or collective social understanding of each classroom). To determine how many items represented the cultural domain (Handwerker, 2001; Johnson & Weller, 2002) within each classroom, I selected items that were listed by at least 15% (Bernard, 2011) of the students (~five students) from each respective classroom.

Table 1.10. and Table 1.11. (below) list all of the responses cited by at least five or more members of Miss Weaver's classroom and Miss Thorton's

classroom, respectively. Regarding the list of expectations along the left-hand column, it should be read in the following manner: “Good science students in (Miss Thorton’s/Miss Weaver’s [respectively, depending on which classroom I was addressing at the time]) class are expected to _____”. To the right of the expectations, I have summed the total number of times that an individual response was cited by students during the free-listing exercise. For example, in Miss Weaver’s classroom during (P_2), 16 of the 30 students felt that good science students are expected to “be boys”, and included this expectation in their free-lists. I have ordered these items from most-to-least frequently cited.

The expectations that appear in the tables below are the same expectations that I typed, printed, and passed out to each student, asking them each to rank the items from most important to least important. The students were instructed to put a “1” next to what they thought was the most important expectation of a good science student, and a “2” next to the second most important expectation, and so on, until they have assigned a different number to every expectation. The mean rankings, to the right of the frequency column, tabulate the average rankings assigned to each of the expectations. In addition to the frequency with which individual expectations are cited, this metric is another measure to determine the most important/relevant expectations of good science students within each classroom In other words, the lower the mean ranking of an expectation, the more important students thought it to be.

Table 1.10. Good Science Students Expectations (Low-Functioning [P_2]).

Expectations Listed (P_2)	**[#]Number of Times Listed**	**[+]Mean Ranking**
be boys	16	12.13
be well behaved/follow the rules	11	4.4
be nice, kind, friendly, or polite	11	4.07
be smart	10	7.1
be cool	9	9.87
*not talk back to teachers	8	3.8
look like a scientist	8	8.7
act like a scientist	8	8.07
be girls	8	12.62
dress nicely/wear nice clothes	7	9.63
do experiments	7	7.7
be active and participate in class	7	5.53
be good listeners	6	5.9
be tall	6	11.53
be happy and have fun	6	8.03
*be good speakers	5	6.37
be funny	5	12.6
*know a lot about science	5	5.4
*get good grades	5	13.23
Total = 19	Total = 148	

Note: Only expectations listed by at least five or more of Miss Weaver's (30/30) students are included here.

[#]Total number of times each expectation was individually cited during the free-list exercises.

[+]Average ranking assigned to this list of 19 expectations (n.b., students were instructed to rank these expectations from 1-to-19, and lower rankings indicate greater importance). Note: Some students assigned the same ranking (e.g., "2", "3", etc.) to several expectations when rank-ordering, thus, failing to assign only one unique ranking (1-19) to each expectation. Mean rankings were calculated on the basis on what students actually recorded (e.g., if several expectations were assigned a ranking of "2" by one student, meaning they were all "tied" for the second most important of all expectations according to that particular student, then these tied rankings were used in calculating the mean rankings).

*Expectations unique to Miss Weaver's classroom, not listed by Miss Thorton's students.

(Source: Grayson Ford Maas Dissertation Research, 2015).

Table 1.11. Good Science Students Expectations (High-Functioning [P_2]).

Expectations Listed (P_2)	**[#]Number of Times Listed**	**[+]Mean Ranking**
be smart	22	11.1
be nice, kind, friendly, or polite	21	2.93
be boys	16	19.34
*be respectful	11	3.9
be well behaved/follow the rules	11	4.48
be cool	10	16.59
look like a scientist	9	15.07
act like a scientist	9	12.66
be active and participate in class	9	6.1
be funny	9	16.28
be good listeners	9	4.28
dress nicely/wear nice clothes	8	16.69
*be awesome/excellent	8	12.41
*wear glasses	7	17.79
be tall	7	17.79
do experiments	6	10.62
*be clever and creative	6	7.52
*be careful and safe	6	9.28
be happy and have fun	6	13.1
*focus and pay attention	6	11.17
be girls	6	19.9
*help others	5	13.83
*be honest	5	10.69
Total = 23	Total = 203	

Note: Only expectations listed by at least five or more of Miss Thorton's (30/33) students are included here.

[#]Total number of times each expectation was individually cited during the free-list exercises.

[+]Average ranking assigned to this list of 23 expectations (n.b., students were instructed to rank these expectations from 1-to-23, and lower rankings indicate greater importance). Note: Some students assigned the same ranking (e.g., "2", "3", etc.) to several expectations when rank-ordering, thus, failing to assign only one unique ranking (1-23) to each expectation. Mean rankings were calculated on the basis on what students actually recorded (e.g., if several expectations were assigned a ranking of "2" by one student, meaning they were all "tied" for the second most important of all expectations according to that particular student, then these tied rankings were used in calculating the mean rankings).

*Expectations unique to Miss Thorton's classroom, not listed by Miss Weaver's students.

(Source: Grayson Ford Maas Dissertation Research, 2015).

After tabulating the results of the free-list exercises from both classrooms, 19 expectations were recorded by at least 15% of Miss Weaver's students, while 23 expectations were recorded by at least 15% of Miss Thorton's students. In Table 1.10. and Table 1.11. (above), the expectations mentioned by at least 15% of students that were unique to a respective classroom are designated with a "*", while those without a "*" were cited across both classrooms. For example, only within Miss Weaver's classroom did at least 15% of students cite that good science students are expected to "not talk back to teachers", "be good speakers", "know a lot about science", and "get good grades", whereas only within Miss Thorton's classroom did at least 15% of students cite that good science students are expected to "be respectful", "be awesome/excellent", "wear glasses", "be clever and creative", "be careful and safe", "focus and pay attention", "help others", and "be honest". Four expectations were unique to Miss Weaver's classroom, while eight expectations were unique to Miss Thorton's classroom, and 15 expectations were cited by at least 15% of the students in both classrooms.

Indeed, an interesting outcome of the (P_2) free-listing exercises was the expectations cited by students that were unique to each classroom. Within Miss Weaver's classroom, the expectation that good science students are supposed to "not talk back to teachers", was not only unique among this group of students, but it received the lowest mean ranking, suggesting that—on average—students within Miss Weaver's classroom believed that this was

the most important expectation of good science students, even more so than two other expectations that were unique among Miss Weaver's students: "knowing a lot about science" and "getting good grades". This result is unsurprising, given the amount of attention that was devoted to managing students' behavior within the low-functioning group. Miss Weaver would frequently, in fact regularly, interrupt lesson plans to address students' "behavior".

Not only was behavior a common theme that cropped up throughout each school day, but Miss Weaver also compared her student's behavior with Miss Thorton's students' behavior. Take the following example, from an early morning science lesson about human body systems in mid-March, when Miss Weaver curtailed the lesson to address an issue that had taken place the previous Friday when Kevin's (a rather reticent and shy boy who wears glasses and clothes one to two sizes too large for his frame) iPhone was allegedly stolen by another one of the students in the class:

> Miss Weaver's tone rapidly switches from one of energetic jubilance to one that is decidedly more serious and somber. Kevin had brought in his new iPhone, left it in his book-bag throughout the school day and at some point, someone had taken it. Miss Weaver lectures the class on just how serious of an offense this is. This room is still and quiet, perhaps the most quiet I have ever heard it. The students are looking around to each other, and some glance back at me, with somewhat

worried looks on their faces. Miss Weaver's tone is a mixture of worry, disappointment, and seriousness. She acknowledges that she knows some students received smart phones for Christmas, but that they are becoming a problem in school. She informs the class that no one will be able to attend tomorrow's kayaking trip in the ocean—something that had been planned for months now; something that I know most students have been very much looking forward to—until the issue is resolved. She stresses several times, "Your actions do not affect only yourselves [her eyes are wide, and she appears to be almost on the verge of letting a few tears stream down from her face]. Your actions affect everyone around you. Whoever did this will have to fess up, otherwise it will ruin it for everyone; no one will be able to go on tomorrow's field trip until someone comes forward to tell me what happened. We will be missing recess today, because we need to find out what happened. Your actions do not affect only yourselves, they affect everyone around you. *I* am affected; *your classmates* are affected; *Miss Thorton* is affected; *Miss Thorton's class* is affected; *Miss Carmille* is affected. Why do all of these problems only happen with *this* class? Why do Miss Thorton's students not have problems with behavior? I feel like I am always talking to you guys about your behavior". (fieldnotes, March 17, 2014)

Unfortunately, the above example is but one of many instances in which Miss Weaver's students were openly reminded of their behavioral deficiencies relative to the peers next door in Miss Thorton's class. Given the amount of energy and class time taken to discuss behavior, in one way or another, it is unsurprising that Miss Weaver's students understood good students as being "well behaved" students first are foremost. This finding is further corroborated by the most frequently cited expectations of good science students—as well as the expectations ranked, on average, as most important—among Miss Weaver's students, as discussed further below.

The results tabulated in the tables above provide evidence for how the two classrooms are not only qualitatively different from one another with respect to the expectations *of* students and the associated norms of participation within the classrooms, but importantly, they are also different with respect to how each space is experienced and imagined by its students.

During (P_2) in Miss Weaver's classroom, the most frequently cited expectations of good science students were that they are to "be boys" (16 citations), "be well behaved/follow the rules" (11 citations), and "be nice, kind, friendly, or polite" (11 citations). In Miss Thorton's classroom, the most frequently cited expectations of good science students were that they are to "be smart" (22 citations), "be nice, kind, friendly, or polite" (21 citations), and "be boys" (16 citations). Two of the top three most frequently cited expectations are the same across both classrooms. That is, the students of

both classrooms frequently cited that good science students are expected to "be boys" and to "be nice, kind, friendly, or polite". The only crucial distinction within the each classroom's top-three list was that Miss Weaver's students' frequently cited *behavior* (i.e., the demonstration of good behavior, and/or the avoidance of displaying bad behavior [e.g., following *versus* not following the classroom rules, etc.]) as a top expectation, while Miss Thorton's students' frequently cited *intelligence* as a top expectation of good science students.

These results are further substantiated by the average rankings assigned to the most frequently cited expectations within each classroom during (P_2). Within Miss Weaver's classroom, students assigned lower rankings on average (meaning, they assigned more importance) to expectations regarding *behavior* than anything else. On average, Miss Weaver's students ranked "not talking back to teachers" (3.8), "being nice, kind, friendly, or polite" (4.07), and "being well behaved/following the rules" (4.4) as the three most important expectations of good science students. Each of these three expectations has to do with the theme of *behavior* in one way or another.

While the students of Miss Weaver's classroom understood themselves as good science students simply if they were able to demonstrate good classroom behavior in general, Miss Thorton's students also seemed to understand the importance of good behavior, but in addition they cited the

importance of *intelligence* as well as the actions and attributes that help students achieve *academic* success in the classroom.

Among Miss Thorton's students, not only was "being smart" the most frequently cited expectation of what it means to be a good science student, but several of the responses unique to this group also point to an embodiment of the *accoutrements* of academically successful students, including "being respectful", "being awesome/excellent", "being clever and creative", "being careful and safe", "focusing and paying attention", and "helping others". "Being respectful" and "helping others" are well-known demonstrations of good teamwork, which can also serve as common denominators of students that experience academic success in school settings as well. The fact that the students of Miss Thorton's classroom readily identified these characteristics as important for being a good student, points to the notion that ideals such as teamwork are actively and regularly promoted in the classroom of the high-functioning students, yet not as much for the low-functioning students.

Similarly, Miss Thorton's students also identified "being clever and creative", "focusing and paying attention", and "being careful and safe" as expectations of good science students, which again, were unique to this group. These responses are of note as well because they represent specific actions (e.g., "focusing and paying attention" and "being careful and safe") and attributes (e.g., "being clever and creative"), which are especially germane for achieving *academic* success in the subject of science,

specifically. Most of the students in Miss Thorton's classroom reported math and/or science to be their favorite school subject/s. Science, however, relative to the other school subjects (e.g., art, English-Language Arts, history, math, etc.), requires a good deal of sustained concentration—the students of Miss Thorton's class (less so for the students in Miss Weaver's class) were required not only to memorize the subject's content matter, but additionally, they were required to *apply* their knowledge through a series of projects and reports throughout the school year. These science presentations—made individually or within small groups—often required students to be creative, which sheds light on why the students of Miss Thorton's class report "being clever and creative" as an important expectation of good science students, while the students of Miss Weaver's classroom did not.

None of the above responses came about in the free-lists composed by Miss Weaver's students during (P_2). What is to be made of this? Clearly, it would be unwise to assume that Miss Weaver's students are different enough or somehow incapable of imagining the unique sets of expectations cited by Miss Thorton's students. If the divergent sets of expectations of good students between the low-functioning students and the high-functioning students (i.e., behavior *versus* intelligence and academic success, respectively) do not ultimately stem from the innate perceptions of the students themselves, then where might these different sets of expectations come from? It remains my contention that these different expectations stem

from, and are reflective of, the two very different social spaces of the classrooms, that is, the sorts of activities that are conducted within the two respective spaces, and how they are conducted differently.

Because *behavior* is a theme that was regularly reinforced in Miss Weaver's classroom (e.g., bad behavior is vehemently lamented, and good behavior is vehemently praised, etc.), students in turn learned to embody these understandings about what makes a good student (irrespective of subject), and then demonstrated this shared understanding when asked about what and/or whom good science students are expected to be, in the free-list and rank-order exercises. Similarly, because *intelligence* and academic success are themes that were more regularly reinforced in Miss Thorton's classroom, students in turn learned to embody *these* understandings and correspondingly demonstrated these shared understandings when asked about what and/or whom good science students are expected to be.

There also existed a shared understanding among the students of Miss Thorton's class, namely, that they are the "smart ones", thus, it is not surprising that the students of Miss Thorton's classroom reported that good science students are expected to "be awesome/excellent", while the students of Miss Weaver's classroom believed that they could achieve the same designation (i.e., being good) simply by showing up, and not misbehaving.

The following examples capture the differences in typical science lessons in between the two respective classrooms. These examples highlight the ways in which the students of the two classrooms experience different opportunities to learn and/or practice science, and by extension, succeed academically in school. The students in the low-functioning group were not *expected* to succeed in the same ways, and with the same frequency, as the students in the high-functioning group. These expectations manifested in the differences in complexity and rigor in classroom activities and assignments. In one of the excerpts taken directly from my fieldnotes, Miss Thorton's class had just transitioned from learning about the different forms of precipitation and the water cycle to learning about clouds; they made this transition within first full month of school during September 2013. In the other excerpt, Miss Weaver's students are still covering the water cycle, as they did not transition to lessons about clouds until the following month. Not only did the two classes move at different speeds in terms of covering content, but importantly, what was asked of the students was very different as well. Miss Weaver's class did not receive the same opportunities to be as intellectually challenged as did Miss Thorton's class. The differences in what was asked of the two groups reflect their different understandings of what it means to be a good science student. The following examples were recorded just two days apart:

> Miss Thorton announces to the class that they will be doing a different activity today (not what the class had recently been working on [i.e.,

researching precipitation for their Sierra Snowpack project])—they will be making a flipbook about information on the different types of clouds. Miss Thorton proceeds to discuss the different types of clouds, and asks students to tell her what they know about them, especially, for example, when it is about to rain. Sol (a thin, gregarious, and very precocious boy with an semi-permanent smile) says the clouds will be black, while a few other students say the clouds will be grey and white. Miss Thorton probes the students for more responses about clouds, but not about their color. Several of the students' responses included words like "puffy", "poofy", and "squishy". "What do clouds have to do with water?" Miss Thorton asks. Rocio answers, "Because they are made of water", and then Miss Thorton probes, "What kind?" I hear one student say "evaporation", and another say "water vapor".

Miss Thorton directs the class to follow her instructions, explicitly, by copying what she writes on the whiteboard into their flipbooks. On the top page: "Types of clouds by ____". She tells the class that they can draw clouds if they wish, but they must also put the date and room number on this page as well. As students work on this assignment in their table groups, I see some pages with clouds drawn and still others that do not. Miss Thorton then explains that each sheet will be devoted to its own cloud type: Cumulonimbus, cumulus, cirrus, stratus, and in that order.

> Miss Thorton stands at the front of the room and begins to instruct students on the next part of the activity: Writing descriptions of each cloud type under each flap, but not to write so much, or so big, because the words would then fill beyond what the pages cover. Miss Thorton picks up Corazon's flipbook, and explains that she will use hers as an example to show everyone what to do, because Corazon's book is "nice and neat". Corazon quietly thanks her, and Miss Thorton tells her she is welcome. As Miss Thorton tells the class where, and how, to write within the flipbooks, Corazon raises her hand to offer the suggestion that everyone should put a small dot near the end of each flap, where it touches the next page, so that everyone knows not to write past that point. Miss Thorton says, "Thank you. That is a great idea, *I* didn't even think of. That is smart". Several students thank Corazon, and Corazon takes the compliments in stride. (fieldnotes, September 24, 2013)

Prior to the lesson on cloud formations, Miss Thorton's students had been conducting water cycle research on the classroom iPads (which, Miss Weaver's students did not have in their classroom until much later into the school year) in mini research teams; later, they made group presentations on what they had found. Miss Thorton's class not only moved past the water cycle more quickly than did Miss Weaver's students, but even more importantly, her students were asked to produce booklets containing

information about what they had learned: They were asked, to be *creative*, which they were then praised for. Miss Weaver's students, on the other hand, lingered on the water cycle, a topic they had been learning for about two weeks at the time. These students were *not* asked to conduct research, they were *not* asked to make presentations or to exercise their creativity in making informational booklets about what they had learned; instead, they engaged in read-alongs and were asked to memorize the lyrics of a rap song about the water cycle. In the following passage, Miss Weaver interrupts the classroom activities to address students' "behavior", a common occurrence for the students in this group:

> Miss Weaver locates a water cycle rap on YouTube (see http://www.youtube.com/watch?v=M__3-nJ2lko) and plays this video for the class on the classroom television mounted to the wall. When the chorus to the song rings aloud, Miss Weaver encourages the students, "Let me hear you!" wanting them to recite along. Several students seem tickled by this song, either smiling or giggling, while others mindlessly mouth the lyrics, while others opt to gyrate their bodies by flailing their arms back and forth and up and down (in accordance with the culturally normative behavior when listening to rap or hip-hop).
>
> However, an equal number of students (slightly more than half of the class) seem to be completely disengaged. Rather than following

along with the lyrics of the song as instructed, some of these students instead choose to draw doodles on papers in front of them, chat quietly with their tablemates, or otherwise simply stare off into space, in what looks like daydreaming. Throughout most of the song, Miss Weaver remains seated at her desk up toward the front of the classroom next to the television. She silently follows along with the lyrics yet recites the chorus aloud. She stops the song midway through, accusing students of not following along. Talking to the students she believes are not on task, "*That* is not following along…*that* is not science; we are following along with the water rap".

Miss Weaver then instructs the class to count the number of verses in the song with her, first calling on Anna (a small and shy girl who has a twin sister [Sophie] in the same class) to help her with this. One boy begins to answer where verse four begins, but Miss Weaver abruptly interrupts him, challenging, "Are you Anna? Didn't think so". Principal Carmille then walks into the room, standing in the front of the doorway observing the class for no more than 15 seconds before leaving. While numbering the verses, Miss Weaver calls attention to certain words in the song, instructing students to underline them. She then asks Jorge (a very energetic and gregarious boy who just transferred from another local elementary school because his family had recently moved) to continue reading along out loud, but she

quickly cuts him off because others around him are talking. She says to the class, “I realize it’s the end of the day, and I know you’re tired. I’m tired too, but we have to keep going”. The reading aloud continues, and a few students begin to “click” and “un-click” their pens in rapid succession. Miss Weaver looks in the direction of the offenders, and tells the class, “If someone next to you is clicking their pen, you have permission to tell them to stop, for being distracting”. No one tells anyone to stop.

One of the words Miss Weaver instructs the class to underline is “transpiration”. Cesar (a short boy who stutters when speaking, with few friends in the class) has trouble pronouncing this word aloud when he is called upon to do so. Miss Weaver stops the song and instructs the class to pronounce the word together, as a group, very slowly, syllable-by-syllable. She typically does this when students have trouble pronouncing words. A few students still pronounce the word as “transportation” instead of “transpiration”. Other words that students experienced difficulty with include “depth”, “ecosystems”, “reservoirs”, “shortages”, and, “surveys”.

While continuing to read aloud, Miss Weaver quietly walks up to the whiteboard to record the following students’ names (Illy, Jackie, Gissel, Raul, Ramon, Malina, Felipe) and does so either because she feels that they are not following along, or because they are talking

during class, or because they are intentionally mispronouncing words to be funny, etc. She does this without comment and without missing a beat.

Finishing up with the water cycle activity, Miss Weaver tells the class that for part of their homework this evening, they are to memorize the water cycle rap so that they can perform it in front of their classmates tomorrow. Miss Weaver tells the class that if they wish to practice, all they have to do is type “water cycle rap” into YouTube, and they will find the video.

The class is now told to take out a paper they received earlier about the Sierra Snowpack. Miss Weaver tells them to scan the short article, reminding the students that to “scan” something is to “quickly read it over”. After she feels the class has had adequate time to do so, Miss Weaver asks the class about things they remember from the first page. Being called upon, Jorge says that he remembers the Sierras “Are the largest source of freshwater”. Javier remembers that there are “A dozen ski resorts there”.

Miss Weaver tells the class that they will do a “quick read”, which is when Miss Weaver reads aloud and then pauses; the students, to show that they are indeed paying attention, must pronounce the next word in the sentence aloud, as a group. When Miss Weaver pauses periodically, a chorus of students fill-in the

> appropriate next word, but certainly not all of the students are participating. Just as with the previous activity, many students (slightly more than half of the class) seem to be completely disengaged. Eventually, Miss Weaver does look up at several "chatty" students to remind them sternly, "We're not talking when I'm reading". She walks to the whiteboard to erase a table point from this group. This particular group of students seems to be pronouncing words incorrectly during the "quick read" activity, as if to declare their disdain for the activity through this act of defiance. A few moments later, Miss Weaver tells the class to put the Sierra Snowpack paper as well as the water cycle rap in the "science section" of their binders. (fieldnotes, September 26, 2013)

As evidenced by the two anecdotes above, what it meant to "learn science" in the two classrooms looked very different. The students of Miss Thorton's class were instructed to take a more active role in the learning process—to produce materials in groups, in this case, pamphlets and presentations about clouds—while Miss Weaver's students assumed a more passive role, individually memorizing the lyrics to a rap song about the water cycle (a topic Miss Thorton's class had completed a few weeks prior).

For the students in Miss Thorton's class, "science" largely revolved around content, creativity, and ideas, while for Miss Weaver's class, what it meant to be scientific became subsumed by prevailing behavioral concerns

and English language proficiency (e.g., students were told to follow strict instructions and to repeatedly pronounce challenging words).

In the example above, Miss Weaver paused the YouTube video to chide several students she believed were not following along; she said, "*That* is not following along…*that* is not science; we are following along with the water rap." Logically, given the way this message was delivered to the class, if *not* following along is *not* science, one could only assume that following along properly *is* science. For the students of Miss Weaver's class, simply following the rules and/or being well behaved became equated with being a good science student, and this notion was well reflected in their responses during the free-list and rank-order exercises.

(4.2.3.) Phase Three (P_3)

During (P_3) I conducted free-lists and rank-order exercises with the students of both classrooms using the exact same experimental design as I did in (P_2). It was important to conduct these exercises twice (i.e., in [P_2] and [P_3]) not only as a means of gathering further evidence regarding the differences in expectations and experiences of the students of the two classrooms, but also as a means of understanding if their experiences and the expectations of them were changing through time.

In Miss Weaver's classroom, 30 students produced a total of 274 individual responses (up from 248 total responses in [P_2]), for an average of

about 9.1 expectations per student (up from 8.27 responses per student in [P_2]). Of these 274 total responses, 86 were unique items (i.e., items listed at least once). Thus, 188 of the responses had been cited by at least two or more students.

In Miss Thorton's classroom, 27 students produced a total of 273 individual responses (down from 284 total responses in [P_2]), for an average of about 10.1 expectations per student (up from 9.5 responses per student in [P_2]). Of these 273 responses, 84 were unique items (i.e., items listed at least once). Thus, 189 of the responses had been cited by at least two or more students. As in (P_2), the students in the high-functioning classroom yielded more responses per student than did the students in the low-functioning classroom (i.e., 10.1 compared to 9.1, respectively).

Table 1.12. Good Science Students Expectations (Low-Functioning [P_3]).

Expectations Listed (P_3)	#Number of Times Listed	+Mean Ranking
be well behaved/follow the rules	27	7.11
^*do all classwork	19	10.93
not talk back to teachers	16	6.63
^*raise their hand	15	11.85
^*study	15	10.26
be nice, kind, friendly, or polite	14	5.26
^be respectful	12	8.74
be good listeners	10	7.54
*know a lot about science	6	11.82
^*work hard	6	12.62
^be responsible	5	9.07
^*try their best	5	9
^focus and pay attention	5	7.19
^learn	5	8.77
*be active and participate in class	5	11.78
^*do all homework	5	9.75
Total = 16	Total = 170	

Note: Only expectations listed by at least five or more of Miss Weaver's (30/30) students are included here.

#Total number of times each expectation was individually cited during the free-list exercises.

+Average ranking assigned to this list of 16 expectations (n.b., students were instructed to rank these expectations from 1-to-16, and lower rankings indicate greater importance). Note: Some students assigned the same ranking (e.g., "2", "3", etc.) to several expectations when rank-ordering, thus, failing to assign only one unique ranking (1-16) to each expectation. Mean rankings were calculated on the basis on what students actually recorded (e.g., if several expectations were assigned a ranking of "2" by one student, meaning they were all "tied" for the second most important of all expectations according to that particular student, then these tied rankings were used in calculating the mean rankings).

*Expectations unique to Miss Weaver's classroom, not listed by Miss Thorton's students.

^Expectations unique to Miss Weaver's classroom during (P_3) and not listed during (P_2).

(Source: Grayson Ford Maas Dissertation Research, 2015).

Table 1.13. Good Science Students Expectations (High-Functioning [P_3]).

Expectations Listed (P_3)	**[#]Number of Times Listed**	**[+]Mean Ranking**
be respectful	21	5.74
*be smart	13	5.19
be good listeners	12	8.74
*be careful and safe	11	8
^be responsible	9	9.44
*be honest	8	8.04
be nice, kind, friendly, or polite	8	11.85
^not talk back to teachers	8	12.82
^*not be loud	7	11.3
*be clever and creative	6	12.11
^*take care of science supplies	6	8.59
focus and pay attention	6	8.44
*be happy and have fun	5	8.5
^learn	5	9.89
be well behaved/follow the rules	5	7.33
Total = 15	Total = 130	

Note: Only expectations listed by at least five or more of Miss Thorton's (27/33) students are included here.

[#]Total number of times each expectation was individually cited during the free-list exercises.

[+]Average ranking assigned to this list of 15 expectations (n.b., students were instructed to rank these expectations from 1-to-15, and lower rankings indicate greater importance). Note: Some students assigned the same ranking (e.g., "2", "3", etc.) to several expectations when rank-ordering, thus, failing to assign only one unique ranking (1-15) to each expectation. Mean rankings were calculated on the basis on what students actually recorded (e.g., if several expectations were assigned a ranking of "2" by one student, meaning they were all "tied" for the second most important of all expectations according to that particular student, then these tied rankings were used in calculating the mean rankings).

*Expectations unique to Miss Thorton's classroom, not listed by Miss Weaver's students.

^Expectations unique to Miss Thorton's classroom during (P_3) and not listed during (P_2).

(Source: Grayson Ford Maas Dissertation Research, 2015).

After tabulating the results of the free-list exercises from both classrooms, 16 expectations were recorded by at least 15% of Miss Weaver's students (down from 19 in [P_2]), while 15 expectations were recorded by at least 15% of Miss Thorton's students (down from 23 in [P_2]). In Table 1.12. and Table 1.13. (above), the expectations mentioned by at least 15% of students that were unique to a respective classroom are designated with a "*", while those without a "*" were cited across both classrooms. For example, only within Miss Weaver's classroom did at least 15% of students cite that good science students are expected to "do all class-work", "raise their hand", "study", "know a lot about science", "work hard", "try their best", and "be active and participate in class", whereas only within Miss Thorton's classroom did at least 15% of students cite that good science students are expected to "be smart", "be careful and safe", "be honest", "not be loud", "be clever and creative", "take care of science supplies", and "be happy and have fun". Seven expectations were unique to Miss Weaver's classroom, and seven expectations were unique to Miss Thorton's classroom.

Additionally, in the tables above, the "^" symbol designates expectations that were cited by at least 15% of students in a respective classroom during (P_3) but not during (P_2). Thus, the expectations without an accompanying "^" symbol designate expectations that were cited by at least 15% of students in a respective classroom during both (P_2) as well as during (P_3).

As in (P_2), the from (P_3) supports that while there was considerable overlap, students in the low-functioning group—more so than the students in the high-functioning group—understand themselves, and others, as good science students based principally on *behavioral* ideals established in the classroom, while the students in the high-functioning group tend to perceive *intelligence* as the most important expectation of good science students.

In Miss Weaver's classroom, the most frequently cited expectations of good science students were that they are to "be well behaved/follow the rules" (27 citations), "do all class-work" (19 citations), and "not talk back to teachers" (16 citations). In Miss Thorton's classroom, the most frequently cited expectations of good science students were that they are to "be respectful" (21 citations), "be smart" (13 citations), and "be good listeners" (12 citations). Unlike in (P_2), none of the top three most frequently cited expectations were the same across classrooms.

Within Miss Weaver's classroom, students assigned lower rankings on average (meaning, they assigned more importance) to expectations regarding *behavior* than anything else. On average, Miss Weaver's students ranked "being nice, kind, friendly, or polite" (5.26), "not talking back to teachers" (6.63), and "being well behaved/following the rules" (7.11) as the three most important expectations of good science students. Each of these three expectations pertains to the theme of *behavior* in one way or another. Within Miss Thorton's classroom, students assigned lower rankings on average to

expectations pertaining to *intelligence*. On average, Miss Thorton's students ranked "being smart" (5.19), "being respectful" (5.74), and "being careful and safe" (8) as the three most important expectations of good science students.

Thus, between (P_2) and (P_3), the differences in the experiences and the expectations of the students in the two respective classrooms did not change significantly through time.

4.3. "Draw a Science Person" (DASP)

(4.3.1.) Introduction

The primary purpose of the (DASP) interviews was to determine the extent to which there exists differences in the degrees of similarity or discord in students' perceptions of—and feelings of affiliation with—"science people" (e.g., scientists, science teachers, science professionals, and college science students) between classrooms. Thus, these methods were administered expressly with the goal of helping to answer central research question (c), that is, how classroom placement impacts students' abilities to claim are perform successful school science identities.

(4.3.2.) The Illustrations

Table 1.14. and Table 1.15. (below) summarize the results of the analysis of the four (DASP) illustrations by classroom. Within each classroom, and for each of the students' four illustrations, I tabulated gender and ethnicity

counts not only in terms of a total count per illustration type (e.g., of the 60 illustrations of scientists from Miss Weaver's class, how many illustrations depicted females, how many illustrations depicted Latinas/os, etc.), but reflected as a percentage as well. For each classroom, I then performed the same counts tabulated across *all* illustration types (e.g., of the 238 total illustrations from Miss Thorton's class, how many illustrations depicted females, how many illustrations depicted Latinas/os, etc.).

While the vast majority of students completed a total of eight illustrations each (i.e., students were asked to produce four illustrations on two separate occasions), not every student in each classroom produced all illustrations when asked to do so on either and/or both occasions. The reasons for this varied from either students taking too much time to complete selected illustrations at the expense of others, to a simple lack of interest in completing the exercise (the students in both classrooms were aware that this assignment was neither graded nor required of them from their teachers—in truth, given the entirely *voluntary* nature of this assignment, I was actually quite pleased with the high response rate I achieved [464 total out of a possible 504 individual illustrations, or, just over a 92% response rate]).

In an effort to preserve the anonymity and confidentiality of the students, none of their illustrations will be copied, displayed, or otherwise distributed here in this dissertation or in any other format whatsoever.

Table 1.14. Gender and Race in (DASP) Illustrations (Low-Functioning).

Illustration Types	**Number (%)**	**Ethnicity/Race**
Scientist:	Male - 48 (80%) Female - 12 (20%)	White - 50 (83.3%) Latina/o - 5 (8.3%) Black - 5 (8.3%)
Science Teacher:	Male - 35 (61.4%) Female - 22 (38.6%)	White - 48 (84.2%) Latina/o - 5 (8.8%) Black - 4 (7%)
College Science Student:	Male - 34 (60.7%) Female - 22 (39.3%)	White - 46 (82.1%) Latina/o - 7 (12.5%) Black - 3 (5.4%)
Science Professional:	Male - 30 (56.6%) Female - 23 (43.4%)	White - 45 (84.9%) Latina/o - 8 (15.1%) Black - 0 (0%)
TOTAL:	Male - 147 (65%) Female - 79 (35%)	White - 189 (83.6%) Latina/o - 25 (11.1%) Black - 12 (5.3%)

Note: Each of Miss Weaver's 30 students were asked to produce all four DASP illustrations twice. Not every student completed each of the four illustrations. The total gender and ethnic/racial counts and percentages for each illustration type are listed above.
(Source: Grayson Ford Maas Dissertation Research, 2015).

Table 1.15. Gender and Race in (DASP) Illustrations (High-Functioning).

Illustration Types	**Number (%)**	**Ethnicity/Race**
Scientist:	Male - 39 (65%) Female - 21 (35%)	White - 52 (86.7%) Latina/o - 5 (8.3%) Black - 3 (5%)
Science Teacher:	Male - 38 (63.3%) Female - 22 (36.7%)	White - 56 (93.3%) Latina/o - 3 (5%) Black - 1 (1.7%)
College Science Student:	Male - 35 (58.3%) Female - 25 (41.7%)	White - 57 (95%) Latina/o - 3 (5%) Black - 0 (0%)
Science Professional:	Male - 40 (69%) Female - 18 (31%)	White - 50 (86.2%) Latina/o - 8 (13.8%) Black - 0 (0%)
TOTAL:	Male - 152 (63.9%) Female - 86 (36.1%)	White - 215 (90.3%) Latina/o - 19 (8%) Black - 4 (1.7%)

Note: Each of Miss Thorton's 33 students were asked to produce all four DASP illustrations twice. Not every student completed each of the four illustrations. The total gender and ethnic/racial counts and percentages for each illustration type are listed above.
(Source: Grayson Ford Maas Dissertation Research, 2015).

(4.3.2.1.) Gender

Between the two classrooms, the breakdown of illustrations depicting males compared to that of females was roughly equivalent—65% of Miss Weaver's students produced illustrations of males, while only 35% were of females; similarly, 63.9% of Miss Thorton's students produced illustrations of males, while only 36.1% were of females. While there exists no significant departure between the two classrooms on this front, there does exist greater variation in the gender assignments for the particular types of "science people" drawn in the two classrooms.

Within Miss Weaver's classroom, there was a clear trend that emerged regarding gender. The proportion of males depicted relative to females is greatest for scientists (80% to 20%, respectively), less so for science teachers (61.4% to 38.6%, respectively), still less for college science students (60.7% to 39.3%, respectively), and least for science professionals (56.6% to 43.4%, respectively). If these illustrations can be interpreted to accurately reflect Miss Weaver's students' assumptions regarding who various science people *are* (irrespective of who they should be), then we can say these students believe that scientists, for the most part, are men and that science people, in general, are men.

Within Miss Thorton's classroom, there was a trend that emerged with regard to gender, albeit not a clear as with Miss Weaver's classroom. The proportion of males depicted relative to females for scientists is 65% to 35%,

respectively, less so for science teachers (63.3% to 36.7%, respectively), still less for college science students (58.3% to 41.7%, respectively), and yet for science professionals, the proportion of males depicted relative to females was greatest (69% to 31%, respectively). If these illustrations can be interpreted to accurately reflect Miss Thorton's students' assumptions regarding who various science people *are* (irrespective of who they should be), then we can say these students believe, for the most part, that science people in general are men.

On the whole, the students of both classrooms depicted more men than women for each of the four types of science people. The students of both classrooms depicted fewer female scientists than science teachers. This finding matched my expectation, as I anticipated uncovering gendered stereotypes concerning students' expectations of *doing* science as a masculine activity and *teaching* science as feminine activity ((Weinstein, 2008). The proportion of male-to-female science teachers depicted per classroom was roughly equivalent as well.

Additionally, because college admission is actively promoted as a worthwhile future goal in both classrooms, it was crucial to ask students to draw what they perceived a college science student to be. In this regard, the students of both classrooms depicted fewer female than male college science students. Since a college degree is a necessary prerequisite (and students are aware of this) for attaining careers in science, these male-dominant

gendered depictions may reflect some of the feelings of exclusion experienced by young girls who may want to aspire to professions in science, yet perceive the attainment of such an aspiration as somehow less acceptable, achievable, and/or appropriate than it might be for boys and young men (Archer et al., 2010; Calabrese Barton et al., 2013; Carlone & Johnson, 2007; Johnson et al., 2011).

While similar in many ways, where the two classrooms diverged in their depictions of science people were in the proportion of male-to-female scientists and science professionals. Miss Weaver's students depicted male scientists with much greater frequency than did Miss Thorton's students (i.e., 80% male to 20% female, compared to 65% male to 35% female, respectively). Additionally, Miss Thorton's students depicted male science professionals with much greater frequency than did Miss Weaver's students (i.e., 69% male to 31% female, compared to 56.6% male to 43.4% female, respectively).

Table 1.16. below sheds more light on the two classrooms' divergence in gender assignments for the science professional illustrations, as it lists (alphabetically) the different professions students cited when I asked each of them to think of a career or job that requires the regular use and/or knowledge of science, other than a scientist, a science teacher, or a college science student.

Table 1.16. Jobs Listed for Science Professional Illustrations.

Low-Functioning Group	**High-Functioning Group**
Architect	Actor
Astronaut	Ambulance Driver (x2)
Barista	Animal Expert
Cashier	Apple Product Maker (x2)
Computer Specialist (x3)	Architect
Dentist	Astronaut (x4)
Deodorant Maker	Car Mechanic
Doctor (x11)	Dentist
Fast Food Server	Doctor (x7)
FBI Agent	Fish Tank Maker
Gardener (x3)	Gardener
Maid	Ice Maker
Medical Examiner	Kool-Aid Tester
Musician	Magician
Nurse	Meteorologist (x5)
Pilot	NASA Engineer
Policeman	Nurse
President of USA	Oceanographer
Telephone Mechanic	Policeman (x7)
Veterinarian	Skater
	Spy (x2)
	Sunglass Maker
	Train Conductor

Note: Each of Miss Weaver's 30 students, as well as Miss Thorton's 33 students, were asked to produce Science Professional (i.e., someone that requires the regular use and/or knowledge of science in their job other than a scientist, a science teacher, or a college science student) illustrations twice. Not every student completed this task, thus accounting for the disparities in the numbers of Science Professional illustrations produced between the two classrooms. The above lists catalogue the various Science Professionals drawn between the two classrooms and are listed alphabetically. Professions with (xN) are Science Professionals that were drawn by more than one student within each classroom. (Source: Grayson Ford Maas Dissertation Research, 2015).

(4.3.2.2.) Ethnicity/Race

While the gender assignments in the students' illustrations are indeed revealing, even more so are the racial and/or ethnic assignments in the students' illustrations. Of the 464 total illustrations produced across both classrooms, students depicted (and confirmed during one-on-one interviews) individuals from just three racial categories: White, Latina/o (which the students almost always referred to as "tan people"), and African-Americans. Of the 464 illustrations, 404 (87.1%) depicted White people, 44 (9.5%) depicted Latinas/os, and 16 (3.4%) depicted African-Americans.

There were a few noticeable differences between the two classrooms as well. Overall, Miss Thorton's students were more likely to have depicted a science person as White, more so than Miss Weaver's students. Correspondingly, Miss Thorton's students were less likely to have depicted science people as an ethnic/racial minority than were Miss Weaver's students. When tabulated across all four types of science people, 189 (83.6%) of the 226 total illustrations produced by Miss Weaver's students depicted White people, while 25 (11.1%) illustrations depicted Latinas/os, and 12 (5.3%) illustrations depicted African-Americans. Compare these statistics to the 238 total illustrations produced by Miss Thorton's students: 215 (90.3%) illustrations depicted White people, while 19 (8%) illustrations depicted Latinas/os, and just 4 (1.7%) illustrations depicted African-Americans.

Looking further into the figures within each classroom, there were a few interesting trends that emerged. Within Miss Weaver's classroom, there was a clear trend that emerged with regard to students' willingness to depict Latinas/os as particular types of science people. In this classroom, the proportion of Latinas/os depicted decreased in direct proportion with the most authoritative forms of science people. That is to say, the *more* authoritative the type of science person being depicted, the *less* likely Miss Weaver's students were to depict them as Latina/o.

According to popular perception within contemporary American society, as in most modern Western contexts, scientists secure the most authoritative claim to science as the active "doers" of science (Latour, 1987, 2004; Richard & Bader, 2010; Weinstein, 1997, 2004, 2008). Then, in order of decreasing claims to authority, come the science teachers as the more passive "transmitters" of science, while next come the college science students as the "transmittees" of science, and then finally, the various science professionals as the invariable "users" of science. Over fifteen percent of the science professional illustrations produced by Miss Weaver's students depicted Latinas/os, compared to 12.5% for their college science student illustrations, 8.8% of their science teacher illustrations, and just 8.3% of their scientist illustrations.

The above trend is significant, of course, if not for any other reason than the fact that all of the students in Miss Weaver's classroom (and indeed

in Miss Thorton's classroom as well) identify as Latina/o. This trend may suggest that the students of Miss Weaver's classroom perceive the *least* authoritative positions with and/or in science in contemporary American society as *most* acceptable, achievable, and/or appropriate for Latinas/os. While slightly similar, the same trend was not present within Miss Thorton's classroom. Under fourteen percent of the science professional illustrations produced by Miss Thorton's students depicted Latinas/os, compared to 5% of their college science student illustrations, as well as 5% of their science teacher illustrations, but then back up to 8.3% of their scientist illustrations.

Overwhelmingly, these data point to the notion that within both classrooms (yet, even more so for the students in Miss Thorton's classroom), students associate science people with White people, and by extension, science—whether doing it, teaching it, studying it, or applying it—as a predominantly White activity. Similar to the discussion provided about gender in the preceding section, if students' illustrations can be interpreted to accurately reflect their assumptions regarding who various science people *are* (irrespective of who they should be), these perceptions may collectively reflect the exclusion experienced by Latinas/os who may want to aspire to careers in and/or with science, yet perceive the attainment of such an aspiration as somehow less acceptable, achievable, and/or appropriate than it might be for White people, and even more specifically, White men.

(4.3.3.) Gender and Race of Science People in the Classrooms

Throughout the course of the school year, the students of both classrooms had been exposed to various science content through short videos and films, most notably of course was the popularly syndicated Bill Nye "the Science Guy". The first time the students were introduced to Bill Nye was fairly early on in the school year during a Monday rotation with Mr. Benzen when the students were learning about the water cycle (see http://www.youtube.com/watch?v=hehXEYkDq_Y).

Nye embodies the stereotypical depiction of a scientist (e.g., "geeky", hyper-articulate, White male with thick glasses and a white lab coat). Even the props on the set help to paint the picture of a "mad" scientist, shrouded in mystery, surrounded by various liquids in jars, steam, and the like. Without recapitulating the above video, piece by piece, Nye walks the students through what condensation is (i.e., condensed water molecules from the surrounding air), showing the various ways in which to induce it (e.g., by staying in a walk-in-freezer for several moments, and then walking back out—condensation forms on his glasses; or, by creating a cloud inside of a large glass jar using water, "dust" from burnt matches, and pressurized air). When Nye creates the condensation cloud, after much build up, he signs off by saying enthusiastically, "It's the water cycle, its condensation, its science!" After the video, and just before the students were dismissed by Mr. Benzen,

Kevin cried out, “I have condensation on my bottle!” Mr. Benzen addresses the class, “See, he’s *living* science!”

When reflecting on the above slice of elementary science classroom life, I cannot help but to be reminded of Matthew Weinstein’s (1997) argument regarding *how* elementary-aged students are introduced to science as a series of almost magical experiments, with predictable outcomes, leading to an uncontestable epistemological worldview. By demonstrating to students, through a series of—what many students describe as “cool!”—experiments, they come to see science *as* these experiments, the results of which (the physical formation of a cloud—understandably difficult to refute), present themselves to the students as irrefutable. In Weinstein’s own words:

> “At the primary and elementary end this structure is established through a structure of feeling (Williams 1977), i.e., an association of nature/science with a state of wonder. Wonder here refers to a state of epistemological openness, a prejudgemental state, one which can be colonized for various interests (Greenblatt, 1991). The rhetoric of science as wonder is consistently presented in schools, television, museums, and books. Elsewhere I have argued that wonder is evoked, sometimes quite explicitly and in the most militaristic language, so that they are dazzled into loving the science/nature connection (Weinstein 1995; Weinstein 1997/forthcoming). A common technique/rhetorical form used to accomplish this is the magic trick (Weinstein, 1997a). In

> the state of awe that the trick produces in students, science (as an undifferentiated and uncontradictory dogma) can claim for itself authority without contest. (Weinstein, 1997, p. 16)

If this “magic trick” does indeed awe students and establish the uncontestable authority claim that science seems to hold on the natural biophysical world, than White males are seen as the magicians. Both Bill Nye and Mr. Benzen fit the stereotypical mold of the geeky White male scientist. Everyday, Mr. Benzen teaches rotations wearing his long white lab coat (a symbol of sorts, one which signifies his exclusive membership as a “magician”, that is, the holder of authoritative and credible scientific knowledge). Students come to meet these practitioners, these “gatekeepers” if you will, through popularized representations of scientists, such as Bill Nye, but also within the textual materials presented to them in class. The scientists the students come to know in short classroom videos as well as in their interactive science textbooks are, for the most part, White males. Given this, it is unsurprising that, when asked to draw illustrations of scientists, 87 (72.5%) of the 120 total illustrations across both classrooms depicted male scientists, while 102 (85%) illustrations depicted White scientists. While the students in both classrooms overwhelmingly see scientists as males, they see them as White even more so.

Representations of scientists, and all credible users of it, need not be adults. In the following slice of classroom life, Miss Weaver transitions from a

read-along activity about clouds and weather to a special “treat” she has in store for the class:

> The “treat” she has prepared for the students is an extended video clip (see http://www.youtube.com/watch?v=u_64HKpaOtE) shown through the classroom TV about the “weather kid”. “I think he’s now famous,” Miss Weaver announces. She then cues up a clip of a local weather station from the Midwest that invites a 9-year old White boy (stereotypically geeky, science-loving, and hyper-articulate) to “do the weather”. The boy is fairly good at this, demonstrating knowledge of the proper TV delivery, technique, stance, green-screen poise, and general weather-related knowledge regarding temperature, precipitation, high and low temperatures, wind currents, and wind speeds. While this boy is presenting, many of the students (especially the boys) begin laughing quite vigorously and pointing at him, especially when he employs hyper-articulate speech. All of this laugher and gesturing occurs, despite the fact that Miss Weaver intended to show this clip as a shining example of what she may believe her students *should* aspire to (e.g., noting that he is “Very intelligent and knew all of the statistics”; then explaining what a green-screen is and how difficult it is to spatially orient oneself to this apparatus successfully), yet, students do not seem to aspire to this model, instead, they seem to distance themselves from it.

> Jorge comments loudly, after Miss Weaver gets through discussing "how intelligent" this boy—who is one to two years younger than all of the students—is: "It's *just* numbers" (i.e., no big deal), Jorge decries in a loud and defensive, trying-to-sound-unimpressed tone. Jorge then defensively adds that when he was at his "old school" (he transferred to Amblen at the beginning of the school year), he had an opportunity to travel to the local Santa Barbara County station (KEYT) to see "weather stuff, *too*", like green-screens and such. (fieldnotes, December 10, 2013)

In the above example, Jorge and several of his fellow students were not only unimpressed by the "weather kid", but also perhaps even irritated by him and everything he embodies (i.e., something they do not identify with—the glorified geeky White boy that gets all of the attention and cool opportunities to be on TV). Potentially even more frustrating for the students was the fact that others, and especially their own teacher, seemed to gush over his performance and demonstration of scientific knowledge as delivered in an extra-articulate, accent-free, English-speaking voice. Given these considerations, it becomes easier to see how Jorge, and potentially other members of the class (e.g., those laughing and poking fun at the video clip), could feel threatened, or even worse, inferior to this "weather kid". After all, Miss Weaver did keep telling them how "smart" she thought he was.

While all of the students in both classrooms identify as Latina/o, skin color and the relative levels of prestige it is symbolic of, was a theme not lost on the students of the fifth grade. During her “Being a Science Student” interview, Angelica, a tall and outgoing girl from Miss Thorton’s class, informed me of how some of the students with the lightest skin (e.g., Oscar and Trevor of Miss Thorton’s classroom) tend to be the same students that are thought of as most “popular”, and who sometimes make fun of other students (e.g., Cynthia, Bianca, and Angelica herself) for having darker skin than they do. In Angelica’s own words, “Like, sometimes they treat us bad because of our skin color, but like, we’re all the same, and sometimes I think in my mind, like, ‘but you’re dark-skinned *too*’.”

(4.3.4.) The Interviews

After having asked each student about their four illustrations of science people (including their imagined families, hobbies, interests, as well as things they like to do for fun, etc.), I asked students to describe their own personalities, families, hobbies, interests, and things they like to do for fun. Then, I asked each student to carefully consider who, among their four illustrations, they feel they are *most* similar to, and why. I then asked each student who, among their four illustrations, they feel they are *least* similar to, and why. I have tabulated the results of these responses across both classrooms, and I have presented them in Table 1.17. (below).

Table 1.17. Students' Affiliation with (DASP) Illustrations.

Low-Functioning Group	**High-Functioning Group**
Most Similar To	*Most Similar To*
Student (x13)	Scientist (x4)
Teacher (x7)	Doctor (x2)
Scientist (x4)	Teacher
Computer Specialist	Student
Veterinarian	Spy
Doctor	Car Mechanic
Least Similar To	*Least Similar To*
Scientist (x10)	Teacher (x5)
Teacher (x9)	Student (x3)
Doctor (x3)	Policeman
Student (x2)	Scientist
President of USA	
Computer Specialist	
Mechanic	

Note: Each of Miss Weaver's 30 students, as well as Miss Thorton's 33 students, were asked to produce all four (DASP) illustrations twice. Not every student completed this task, and 27 of Miss Weaver's 30 students—as well as 10 of Miss Thorton's 33 students—participated once in the (DASP) individual interviews. Students were individually asked to state which of their illustrations they felt they were most similar to as well as least similar to. The above lists catalogue the students' individual responses across classrooms. Responses with (xN) represent the number of times students claimed to be most or least like a given illustration. Other than Scientist, Teacher, and Student, individual Science Professional responses are listed here if students believed they were most or least like these particular illustrations.
(Source: Grayson Ford Maas Dissertation Research, 2015).

Reflecting upon Table 1.17. (above), the most striking pattern regarding differences in responses between the two classrooms is the relative frequency with which “Scientist” appear in the “Most Similar To” versus the “Least Similar To” lists. When asked about whom they felt they were most similar to, Miss Weaver’s students believed that they had the *most* in common with the college science students they had drawn, as 13 (48.2%) of the 27 students responded in this way. Next in line, seven (26%) of 27 students felt that they had the *most* in common with the science teachers they had drawn. Among Miss Weaver’s students, only four (14.8%) of the 27 students felt as though they had the *most* in common with the scientists they had drawn. Similarly, 10 (37%) of the 27 students believed they had the *least* in common with the scientists they had drawn, more so than any of the other (DASP) illustrations.

These figures look very different for Miss Thorton’s students as four (40%) of the 10 students believed they had the *most* in common with the scientists they had drawn. Similarly, only one (10%) of the 10 students believed they had the *least* in common with the scientists they had drawn.

For Miss Weaver’s students, they seemed to agree that all scientists are very hard-working and smart people, meaning that they not only understand very challenging concepts and content (which, they felt science seems to contain a preponderance of), but that they grasp these concepts and content rather *quickly* and with relative *ease*, and furthermore, that they

are able to *explain* these concepts and content to others quite well. The students told me that these are some of the "ingredients" that comprise "smart" science people, and they believed that scientists—when compared to the other three types of science people—seem to possess them in the greatest quantities.

Miss Weaver's students also seemed to feel that they somehow lacked the ingredients that give rise to becoming smart science people, a shared perception that indeed sheds light on perhaps why only four (14.8%) of the 27 students felt as though they had the *most* in common with the scientists they had drawn, while similarly, 10 (37%) of the 27 students believed they had the *least* in common with the scientists they had drawn, more so than any of the other (DASP) illustrations. The following quotes were taken directly from Miss Weaver's students during the (DASP) interviews and will shed light on their shared perceptions of inferiority.

Savannah felt like she was *least* similar to the scientist (whom she had drawn as a White female). When I asked her why she felt this way, she told me, "I'm not that smart at science. I'm not that smart compared to other students; they answer questions quickly, and I'm a little slow." Savannah felt as though she was *most* similar to the science teacher (whom she had drawn as a White male), yet instead of noting any *positive* attributes and/or qualities she felt she shared with this particular individual, it was a lack of confidence, which she believed made them most similar to one another: "I'm most similar

to him because he is nervous, and I am nervous to pass the fifth grade and to get into the sixth grade."

Another student from Miss Weaver's classroom, Elena, felt as though she was *most* similar to the college science student (whom she had drawn as a White female). Elena felt she was most similar to the college science student, not for any academic and/or intellectual reasons, but simply because she felt that they shared an interest in various games she likes to play and because, in Elena's words, "We like all the same things". For the students of Miss Weaver's classroom, similar trends pervaded many of the explanations regarding perceived similarities with the individuals depicted in the (DASP) illustrations. Like Savannah as well as many of the peers in her classroom, however, Elena felt like she was *least* similar to the scientist (whom she had drawn as a White male). When I asked her why she felt this way, she echoed sentiments similar to those of her classmates, namely, a lack of confidence in herself as a smart science person: "I feel like I *like* science, but, I'm just not ready for it yet. I need more time."

Of all of Miss Weaver's students' explanations about the perceived similarities or differences with the individuals depicted in their (DASP) illustrations, none were quite as revealing, nor as moving, as Jorge's. Jorge felt as though he was *most* similar to the college science student (whom he had drawn as an African-American male). Similar to Elena, Jorge felt he was most similar to the college science student, not for any academic and/or

intellectual reasons, but simply because of a mutual adoration of sports, and especially basketball and football. Jorge felt like he was *least* similar to the individual depicted in his science professional illustration (the President of the United States, Barack Obama—Jorge believed that the President uses science with regard to being able to "check" the work of all of the chemists that he has working for him, "Because it is important to know about which chemicals they are using"). When I asked Jorge why he felt he was *least* similar to the President of the United States, he told me:

> I'm going to be something *less*. I'm most not similar to Barack Obama, because he is the President of the United States, and I'm going to be something less. He's up *here*, and I'm all the way *down here*. I'm not gonna have that good of a job, and he already has the best job that anybody could have, but I don't think I'm gonna have the best job. I think I'm gonna follow in my dad's footsteps as a roofer. I would want to follow in my dad's footsteps and just be like him, but also, no, because I would want to be a professional football player, but I don't think I have the best grades that I really could have. Barack Obama got the best grades. He studied a lot, and I don't, like, study a lot. I feel like I can't get good grades, because I know I'm not good at math or language arts. (Jorge, [DASP] Interview)

Jorge's comments above reflect many of his classmates' shared feelings of inferiority, coupled with an almost debilitating lack of confidence, especially regarding intellectual tasks, as well as in attributes and/or qualities that are typically valued in school and that translate to school success, such as work ethic (e.g., to "study hard", etc.). What is perhaps even more revealing is that Jorge seemed to feel the way he does *despite* the fact that many of his classmates, in addition to Miss Weaver herself, believed Jorge to be one of the "better" students in the group. In speaking with his peers informally about this, they believed this because Jorge regularly participated and because he usually assisted other students with classroom assignments whenever possible. Being that Jorge did not view himself in the ways that his peers did, his menial understanding of self points less to low self-esteem, but rather, more so to the social learning that took place as part of a "low-functioning" classroom, whereby students came to feel that they somehow lacked the ingredients that make up what it means to be smart science people.

Miss Weaver's students may have come to view themselves as "good" students, but only insofar as they were "well behaved" students, whereas they were much more willing to assign the "good" as "smart" connection—and all of the prestige that comes along with this designation—to their peers in Miss Thorton's classroom next door. Much more discussion will be provided about this below in (*Students' Perceptions of the Two Classrooms*).

Similar to Miss Weaver's students, Miss Thorton's students also seemed to agree that all scientists are very hard-working and smart people, meaning that they not only understand very challenging concepts and content (which, they felt science seems to contain a preponderance of), but that they grasp these concepts and content rather *quickly* and with relative *ease*, and furthermore, that they are able to *explain* these concepts and content to others quite well. Again, it was believed that these are some of the ingredients that comprise smart science people, and that scientists—when compared to the other three types of science people—seem to possess them in the greatest quantities.

However, unlike Miss Weaver's students, Miss Thorton's students felt that they *do* possess some of the ingredients that make them smart like scientists—much more so than Miss Weaver's students—as four (40%) of the 10 students in Miss Thorton's classroom believed they had the *most* in common with the scientists they had drawn, that is, more so than the other three DASP illustrations. Take, for example, quotes from the following three girls in Miss Thorton's class in their explanations of the perceived similarities between themselves and the scientists they had drawn. Angelica believed that she was *most* like the scientist (whom she had drawn as Latina), because she likes to "help people" and because she "likes science". Alexis felt that she was *most* like the scientist (whom she had drawn as a White female) because of her affinity and proclivity for reading. In Alexis's own

words, “Scientists like reading and are good at reading, and I like reading because the stories are interesting.” Finally, Rocio felt that she was *most* like the scientist (whom she had drawn as a White female) due to a shared determination and work ethic she felt she shares with scientists. In Rocio’s own words, “I want to work hard to get to my goal, and I kind of really like studying.”

4.4. “Being a Science Student”

(4.4.1.) Introduction

The primary purpose of the “Being a Science Student” interviews was to understand the school science experiences from the perspective of individual students, as well as the ways in which students understand constructs such as “intelligence” and “success” differently across both classrooms (Hatt, 2011). These interviews also gauged the extent to which students understand themselves and their classmates as competent and/or successful science students, in addition to their perception of the differences, if any, between the two classrooms. Thus, the questions asked of students throughout these interviews provided data that, once analyzed, was able to provide partial answers to each of the three central research questions.

(4.4.2.) Two Students

I was able to identify several students—three from each classroom—that either regularly embodied, resisted, or worked to transform (i.e., hybridize) what it meant to be a successful science student (Brown, 2004; Calabrese Barton & Tan, 2010; Carlone et al., 2011; Kane, 2012). Throughout (P_2) and (P_3), these students served as key informants (Spradley, 1979), and while nearly every student across both classrooms exhibited elements of embodiment, resistance, and/or hybridization—at times in varying combinations—these key informants served as representatives of emergent ideal types of the "Social attitudes regarding identities, roles, dispositions, and other self-related structures that are organized into a coherent system of normative expectations" (Dennis Korth, 2007, p. 78). These case studies brought to life and substantiated my developing theoretical models regarding how one successfully navigates school and school science through the lens of individual experience.

Below, I highlight two individual students (Elena from Miss Weaver's classroom and Catalina from Miss Thorton's classroom), as students that very well captured or embodied what it meant to be a good and/or smart science student within each respective classroom. By showcasing their individual, yet representative, experiences with the sociocultural milieu of each tracked classroom, in addition to their perspectives on *intelligence* and the display of it, I aim to demonstrate how the classrooms themselves (e.g., the peer group

pressures as well as the social punishments and rewards, etc.) shaped: The opportunities for students to succeed in school science (central research question [a]), how students' negotiate the concept of success in school science (central research question [b]), and the ways in which students can claim and perform successful school science identities (central research question [c]).

(4.4.2.1.) Elena from the Low-Functioning Classroom

Elena is a quiet, but very happy and pleasant 11-year-old. She is tall for her age, she wears glasses, and usually comes to school in the same light-grey fleece sweatshirt almost everyday. She has a twin sister, Joanna, a student in Miss Thorton's classroom. Elena wants to go to college when she is of age, and would like to go to UCSB if she is able, because bother, her father, and her grandmother work there as custodians. Like most of the students in her class, Elena was born in the Untied States, but both of her parents were born in Mexico. Elena speaks English and Spanish, but she prefers English. She believes that her older sister, now 15, will be the first in her family to attend college. If she gets the opportunity to go to college, Elena would like to study birds, because she is fascinated by their different plumages and admires how they rear their young. Someday, she would like to work for a zoo.

Elena openly admits that she likes science, and when asked why, she tells me, “Science is, like, my life, because you get to see if you can make stuff and if you are right. Anywhere I go, they [i.e., family and friends] tell me to do science.” For Elena, “Science is a place where you get to do experiments, make hypotheses, and to learn if your answer is correct or not…We use science to see if we are right.” While Elena believes that math and science are her “best” subjects, she concedes:

> ELA is easy for me. Last year, I read 13 books, and this year, I’m trying to pass 13 books or get to 13 books…I like books about people getting in trouble, because there is always a solution, and the problem gets fixed by the helper or someone else.

Elena enjoys these types of books because “there is always a solution”, much in the same way that she perceives science to be: Black-and-white, right-or-wrong, there is always a correct answer waiting to be concluded.

When asked about what she believes constitutes a “smart science person”, or a “good science student”, Elena recapitulates what the “Being a ‘Good’ Science Student” free-list and rank-order exercises demonstrated from Miss Weaver’s classroom, namely, that good or smart students are first-and-foremost *well-behaved* students. In Elena’s words, “I’m a good science student, because I follow directions, and I do what the teacher is asking me to do. And when Miss Weaver says, ‘Don’t write in complete sentences’ [when taking notes], I just jot things down.” For Elena, and many of her classmates,

being smart is simply a matter of obeying, and in this way, Elena is a prime example a student that embodies or conforms to the shared perception of what it means to be a good science student within the social space of Miss Weaver's classroom.

Midway through the "Being a Science Student" interview protocol, I asked students if they believed that their classmates, family, friends, and teachers thought they were good at science. When asking this question to Elena, regarding Miss Weaver's perceptions of her, she told me that Miss Weaver indeed thinks she is a good student, but when I pushed her to consider *why* she feels this way, the example Elena provided as evidence was most revealing:

> Miss Weaver thinks I'm good because one time I had to go to the restroom, but instead of going, I waited for her to finish her instructions, and *then* I went to the restroom, and came back, and *then* I did the experiment.

Elena believed that she positioned herself as a good student merely by not interrupting her teacher. Then, when I asked Elena if she felt that her classmates and friends at Amblen thought she was good at science, she was decidedly more unsure and tentatively replied, "I think so". In Elena's own words:

> I don't always like doing science in school, because sometimes when I get things right, people make fun of me. They call me "four-eyes"

> because of my glasses. So when I do experiments with other people in school, I won't let them see how good I am. I mean, if we do, like, science vocab just with a partner, then yeah sure, I'll do *that*, but…I don't want to show people what I am good at because I don't want to be made fun of.

The above passage is particularly revealing, especially because of Elena's embodied understanding of the normative practices of her peer group within Miss Weaver's classroom, and particularly with regard to the social rewards one stands (or does not stand) to receive if they are to present oneself as *academically* and/or *intellectually* smart in a more stereotypically conventional sense (as is more common practice for their peers next door in Miss Thorton's classroom).

Elena had often attempted to present an identity as academically and/or intellectually smart in the presence of her peers within her classroom, but only to be marginalized and ostracized instead of being congratulated and praised. Elena's desire to present her understanding of self as capable, confident, and intelligent was frequently interpreted by her peers as "showing off"; so instead of allowing this aspect of identity to be nurtured, she hid it and shunted it. Consequentially, Elena participated in the more socially acceptable activities of her classroom, as mediated by the students of Miss Weaver's classroom.

Contrary to the creative activities of Miss Thorton's classroom that more frequently allowed for students' identities that were presented as academically and intellectually smart to be rewarded (discussed in greater detail below), many of the activities of Miss Weaver's classroom (including language drills and vocabulary drills) did not readily allow for similar rewards.

(4.4.2.2.) Catalina from the High-Functioning Classroom

Catalina is a very articulate, reserved, shy, and quiet 11-year-old. She laughs and smiles with a few of her fellow classmates from time to time, but she is not what one might readily call "outgoing". Catalina told me once that she likes to "dance and party", but this does not seem to fit with her regularly displayed behavior. She wears glasses and always has her hair pulled back behind her head in a ponytail, and practices a nearly perfect upright posture when seated. Her clothes are clean and almost wrinkle-free, which is not normative for a young person of her age. Catalina is very kind and respectful to others. When she grows a little older, she wishes to attend college, so that she can one day become an architect, engineer, or photographer. She is a recent addition to Amblen, having just moved from Oklahoma (and prior to that, Los Angeles) to Santa Barbara with her family in June of 2013 to be closer to the rest of her extended family, whom she visits in Los Angeles nearly every weekend. She has one younger nine-year-old brother in the third-grade student at Amblen, and her mother and father are both elementary

school teachers. Everyday after school, Catalina eats a snack, and makes sure to finish *all* of her homework before even thinking about playing, so she told me.

Catalina was born in California, as was her mother, but her father was born in Mexico, as were all four of her grandparents. She has never been to Mexico, and when I asked her if she would like to visit, she replied off-handedly, “Only the nice parts, because I am scared that it’s not safe.” Both her mother and her father speak Spanish, but only “sometimes” during family outings and equally infrequently in the home to she and her brother. Catalina speaks English (as one of four students that are English-only speakers in Miss Thorton’s classroom as well as only one of seven English-only students in the entire fifth grade), reluctantly telling me that her mother would like for her to learn more Spanish (because her family may move to Mexico, which she wants no part of), but Catalina does not want to learn the language. When I asked Catalina to elaborate on why she does not want to learn to speak Spanish, she told me, “I don’t really like that language; it’s a little weird and different.”

For Catalina, “Science is kind of everything and everywhere”, and when I asked her to explain in greater detail, she pointed to the trees outside, “Like, even those trees over there, they are science because of photosynthesis. Everything can be studied like that to see what it is.” Catalina possesses a utilitarian view of science in which, “We use science to learn

about things and make things so that we can have an easier life." Catalina likes science because it is "fun", for instance, when participating in experiments during Mr. Benzen's Monday science rotations. Catalina believes math to be her "best" subject in school, and not because it is easy, but instead, "*Because* it is challenging, like a puzzle, and *that* makes it fun" (italics my own emphasis). Catalina's response and explanation about her "best" school subject is reflective of Miss Thorton's students' general perceptions about how to assign value to learning experiences. Miss Thorton's students have been taught and conditioned to understand that being challenged academically and intellectually is a *good* thing, and not an indicator of one's inferiority or *lack* of intelligence.

When asked about what she believes to be the expectations of a smart science person, or a good science student, Catalina's response differed significantly from Elena's, which revolved around demonstrating good behavior. For Catalina, academic achievement is the most reliable indicator of one's intelligence in the classroom. This sentiment was echoed and reinforced by Miss Thorton, whom Catalina quoted as saying (in regard to the California State Standardized Science Exams taken in the Spring), "These tests will follow you to junior high school and to high school, and it will determine which classes you get into there." The implied logic of this statement is simple: Grades and scores reflect one's ability, aptitude, and intelligence, and will be used to place *individual* students into semi-permanent

groups of students sharing *similar* abilities, aptitudes, and intellects. In this way, Catalina understands herself as smart because she achieved the highest grades possible in nearly all subjects.

When Catalina was asked to consider if her classmates, family, friends, and teachers thought she was good at science, she told me, “Yes, they think that I am good, because they think I am really smart, because I got 100s on my reports and tests.” Catalina also believes that someone has the privilege of being considered smart if they can demonstrate that they have acquired a lot of content knowledge about any specific topic. In this way, Catalina recapitulated what it meant to be a good or smart science student within the social space of Miss Thorton’s classroom. Catalina’s articulate speech, good grades, high level of content knowledge, as well as her perception of challenging schoolwork as something to look forward to are all qualities that Miss Thorton’s students have learned to display *as* smart students, because they have learned to distribute to each other the corresponding social rewards for presenting oneself as *academically* and/or *intellectually* smart.

The enculturation and socialization that took place in Miss Weaver’s classroom ran counter to this, as Miss Weaver’s students, including Elena, learned *not* to present themselves as *academically* and/or *intellectually* smart, for doing so could marginalize them within the peer group. Instead, these students learned to be good and/or smart students simply by following

instructions and by being well behaved. In this regard, the cultural and social learning that took place within the classrooms was much more horizontally influenced (i.e., peer-motivated) rather than vertically influenced (i.e., from authority figures especially teachers).

(4.4.3.) Students' Perceptions of the Two Classrooms

In addition capturing the ways in which individual students of the two classrooms experienced everyday school life at Amblen and science education specifically, I wanted to know what students thought about the two classrooms in general (e.g., if the two classrooms are different or similar and what they cite as evidence for these perceptions, what these differences or similarities *mean*, whether any perceived differences are necessarily good or bad, etc.). Even though, to me, the differences between the two classrooms were abundant and obvious, it was very important to capture students' perceptions of this, and to understand the ways in which any explicit awareness of difference impacted them emotionally and intellectually as well as their self perceptions as learners.

I asked students a series of questions about the two classrooms at the end of the "Being a Science Student" interview protocol. In total, I conducted these interviews with 10 students from Miss Thorton's classroom as well as 29 students from Miss Weaver's classroom. After having spent several months observing both classrooms, I expected the results of this portion of

the interview to reflect what I believed to be significant differences in the ways students are *expected* to learn. While the students' answers to the following questions did not surprise me, they captured a shared understanding that the two classrooms are in fact different, that they are different in specific ways, and that there are different meanings associated with being a student in one class and not the other.

Below, I have selected a few of the questions that I asked each of the students. I have summarized the results of the students' responses, across both classrooms, as there were no significant distinctions between the two classrooms regarding responses to the following questions:

- *There are two classrooms in the fifth grade. Do you think these classrooms are more similar to one another or more different?* When asked this question, *every* student (regardless of classroom) responded similarly—that is, they *all* believed that the two classrooms were *more* different rather than more similar to one another. However, the reasons individual students cited for these differences did differ slightly, either in kind or degree.
- *Do these two classrooms learn at different speeds?* Every student, except one (Lalo from Miss Weaver's classroom), believed the two classrooms learned material at different speeds, and more specifically, Miss Thorton's students learned content *more quickly* than did Miss Weaver's students. For example, almost every student agreed that

Miss Thorton's students learned specific concepts and content *before* Miss Weaver's students and/or that Miss Thorton's students moved from topic to topic more *quickly* than did Miss Weaver's students.

- *Are the expectations of the students in one classroom different from the expectations of the students in the other classroom?* All but three students (Catalina from Miss Thorton's classroom, as well as Selena and Sophie from Miss Weaver's classroom) believed that what was expected of students in one classroom is different from what was expected of students in the other classroom. More specifically, most students felt that Miss Thorton's students were expected to learn more content, to learn content more quickly, and to *do more* (e.g., be more active, participate more, engage in more group activities, such as making various presentations, projects, and reports, etc.) than Miss Weaver's students.

- *Do you think that one classroom is smarter than the other classroom? If so, which one?* Every student except one (Odalis from Miss Thorton's classroom) agreed that the students of Miss Thorton's classroom were smarter than the students of Miss Weaver's classroom, citing many overlapping examples of evidence for this belief. Odalis, the only student that did not think that Miss Thorton's students were smarter than Miss Weaver's students, felt that neither Miss Thorton's students nor Miss Weaver's students were smarter than

one another. However, *no* student believed that Miss Weaver's students were smarter than Miss Thorton's students.

- *Do you think that some students think they are smart <u>because</u> they are in Miss Thorton's class?* Speaking more to how students understand *others'* levels of intelligence as a result of being in Miss Thorton's classroom, every student except two (Odalis from Miss Thorton's classroom and Jennifer from Miss Weaver's classroom) believed the students of Miss Thorton's classroom thought that they were smart *because* they were members of Miss Thorton's classroom.

- *Do you think that some students think they are <u>not</u> as smart <u>because</u> they are in Miss Weaver's class?* And similarly, again speaking more to how students understand *others'* levels of intelligence as a result of being in Miss Weaver's classroom, every student except two (Odalis from Miss Thorton's classroom and Jennifer from Miss Weaver's classroom) believed that the students of Miss Weaver's classroom thought they were either *not* smart and/or *less* smart than the students of Miss Weaver's classroom *because* they were members of Miss Weaver's classroom.

Below, I have compiled a list of quotes from the students of both classrooms when asked specifically about the differences between the two classrooms, including the reasons why they felt they way they did and/or the types of evidence they cited to support their beliefs. While the students of both

classrooms agreed that the two classrooms were indeed different—including specific examples for the ways in which they differ—the students of Miss Weaver's classroom were much more vocal about declaring Miss Thorton's students as being "smarter", "better", "higher", and/or "more advanced" than themselves, whereas Miss Thorton's students were decidedly more reluctant to be as explicit in their responses. Evidence of this presents itself in the list of students' statements below, which begin with only a handful of quotes from Miss Thorton's classroom:

- "We do things first." (Yeli, Miss Thorton's classroom)
- "We are learning at different speeds…Miss Weaver teaches things later than us." (Catalina, Miss Thorton's classroom)
- "We learn different things." (Odalis, Miss Thorton's classroom)
- "Miss Weaver's class does Read 180 and we do not." (Diego, Miss Thorton's classroom)
- "We don't, like, fight like they do." (Stephanie, Miss Thorton's classroom)
- "They are high and we are low….They are smarter." (Javier, Miss Weaver's classroom)
- "They passed us in the state reports…They explain things better…People say I am in Miss Weaver's class because I am dumb." (Cesar, Miss Weaver's classroom)

- “They do more math than us, but we have more fun than them. We have more recess and play more.” (Lalo, Miss Weaver’s classroom)
- “In Miss Thorton’s class, everyone always participates and asks questions, and in Miss Weaver’s class, kids are always getting suspended and getting detentions.” (Kevin, Miss Weaver’s classroom)
- “The classes are different in language arts, like with Read 180, we do that and they don’t do that…Miss Thorton’s class is really smart, but in our class, there is only a little bit of people who are smart…Their class goes ahead of us.” (Jackie, Miss Weaver’s classroom)
- “Miss Thorton’s class is better…Miss Thorton knows more about science than Miss Weaver, because Miss Thorton taught fifth grade before and Miss Weaver only taught Kindergarten.” (Sophie, Miss Weaver’s classroom)
- “They are expected to learn more.” (Aaron, Miss Weaver’s classroom)
- “They are way ahead than us…We do Read 180 and they don’t…They are on a higher level than us…They are the winners of everything…They say ‘we are smarter than you’.” (Jennifer, Miss Weaver’s classroom)
- “They have all the people that pay attention, and we have all the troublemakers.” (Alejandro, Miss Weaver’s classroom)
- “They learn things first.” (Maricruz, Miss Weaver’s classroom)

- “They do more reports than us…They don’t do Read 180…They have a smarter class than us…They say, ‘I’m smarter than you’.” (Francisco, Miss Weaver’s classroom)
- Miss Thorton’s class is smarter than our class, because they always learn things ahead of us…They are the ones that are smart…They learn the hard parts and we learn the easy parts.” (Gabby, Miss Weaver’s classroom)
- “They are smarter than us, more advanced.” (Jacob, Miss Weaver’s classroom)
- “They think good and have all the right answers and we don’t know as much.” (Gissel, Miss Weaver’s classroom)
- “Miss Thorton’s class has the science people.” (Felipe, Miss Weaver’s classroom)
- “Miss Thorton has the smart class and Miss Weaver has the dumb class…They are far ahead…We have Read 180 and they don’t…They’re better than us.” (Ramon, Miss Weaver’s classroom)

As the quotations above demonstrate, almost all of the students in Miss Weaver’s classroom agreed that the two classrooms were indeed different—and specifically, that Miss Thorton’s students were some combination of “smarter”, “better”, “higher”, and/or “more advanced” than Miss Weaver’s students—the following six students provided especially insightful responses, whether simply providing more detailed information regarding the differences

between the two classrooms, or through sharing how being in the low-functioning group affects them emotionally:

- “All of the smart people are in Miss Thorton’s class, and we need help. They are the ones that answer questions and they know everything…It’s a good thing to have two different classes, but not for us in Miss Weaver’s class.” (Savannah, Miss Weaver’s classroom)
- Miss Thorton’s class is the higher class, and we’re the lower class. I know that because they get harder homework, and we get the lesser homework, and they are, like, the intelligent people…They all raise their hands like fast, and in Miss Weaver’s class, there are only, like, three or four people having their hands up. Miss Weaver checks our homework and they don’t do that in Miss Thorton’s class…They say, ‘They don’t know anything’…I think that having two different classrooms is good because if you had two people that are not as smart as each other, then the smarter person might be laughing at the other person…Its hard to be in their class. I wouldn’t get anything that they are doing.” (Illy, Miss Weaver’s classroom)
- “Miss Thorton’s class is always well behaved…They’re ahead of us in everything…They’re in a higher and smarter class than us…They do things better and smarter, that’s what my mom told me from back-to-school night, that so far I’m in the lowest class. That’s what Ms. Carmille told my mom.” (Anna, Miss Weaver’s classroom)

- “Miss Weaver says that we’re way behind. Other kids from Miss Thorton’s class tell me that, ‘Your homework is so easy. My homework is harder, because I’m in the advanced class, and you guys are not.’ It makes me feel sad, because we’re all in the fifth grade, so what’s the deal about that?” (Elena, Miss Weaver’s classroom)
- “Miss Thorton’s class is very smart, and we need more help. They don’t need a lot of help. We need help with reading because we do Read 180…They’re ahead of us, kind of in everything…Sometimes I feel sad, because like, I didn’t study hard enough. It’s *my* fault…I’m not challenged in Miss Weaver’s class.” (Gloria, Miss Weaver’s classroom)
- “Everyday, the boys in Miss Weaver’s class have to get into trouble. Ms. Carmille said our class was ‘acting pathetic’ because we know the rules but…All the bad boys are in our class. Miss Thorton’s class is higher and more advanced, smarter…We need a ticket to go to the bathroom, but they don’t need one. They have the freedom to go to the bathroom if they want…Having two different classrooms is a good thing, because Miss Weaver helps us.” (Rocio, Miss Weaver’s classroom)

The above quotations, all taken from girls in Miss Weaver’s class, capture many things, but one of the more prominent themes they capture were the truly mixed feelings these students (and other students) had about whether or not having two classrooms that were treated differently, given different

assignments, taught differently, and had—according to their collective perceptions—different types of students within them, was necessarily a good or a bad setup.

Illy and Rocio seemed to agree that having two separate classrooms (i.e., one for smart students, and another for less smart students) is a rational arrangement. Rocio feels that one class may need more “help” than the other, and thus the teacher of that class should spend their time assisting the group in ways that the other group might not need.

These sentiments were also echoed by several of Miss Thorton’s students when asked about the utility of having two different classrooms and whether it was necessarily a good or bad thing. For example, Yeli praised this arrangement on the grounds of efficiency, namely, that a teacher’s responsibilities would be worn too thin if they had to focus on too many different students with different learning styles and differing amounts of content knowledge about various subjects. In other words, Yeli recited the so-called “common sense” approach (albeit, a common sense approach that heavily favors the teachers, at the expense of the students) to dividing students based the ease of facilitating and managing responsibilities for teachers and administrators. Similarly, Catalina thought that dividing students based on presupposed differences in ability and aptitude was indeed the most rational setup because “Some people are better at learning different things”. In other words, Catalina recounted the so-called “greatest good for

the greatest number" justification of tracking, as it is in the *students'* best interests, which assumes that different learning styles and/or students with differing amounts of content knowledge about various subjects are better educated (meaning, they perform better—even if they are not challenged) when they are grouped with other students that are most similar in ability level to themselves.

Illy seemed to agree with Catalina in that dividing students into two classrooms, and thereafter teaching them and treating them differently because of who they are and what they know (or perhaps even more accurately, what they do *not* know), was not only better in general, but specifically because it was what was best for the students themselves. Illy, however, took this understanding a step further in supposing that dividing students on these grounds was not only *academically* and *intellectually* best for students, but it was also *emotionally* best for them as well. She demonstrated this understanding when she stated, "I think that having two different classrooms is good because if you had two people that are not as smart as each other, then the smarter person might be laughing at the other person". Illy took for granted the notion that if students with different ways of displaying intelligence are placed within the same social learning space, that it is nearly compulsory for one (i.e., the so-called "smarter" student) to make fun of the less smart students. Illy also casted doubt on herself as a learner, further justifying and reinforcing her positionality within Miss Weaver's

classroom as acceptable and appropriate: “Its hard to be in their [i.e., Miss Thorton’s] class; I wouldn’t get anything that they are doing”.

While some of the students thought that tracking is an inherently fair and rational practice, other students did not see it that way, and the quotes above from Savannah, Gloria, and Elena demonstrate this. Savannah was perhaps the most forward and up-front with her assessment of tracking. Her sentiments are shared by what most scholars that have conducted research on the “benefits” of tracking have long concluded (e.g., see Oakes, 2005), namely, that this practice helps those in the “gifted” or “higher” tracks while it only hurts those in the “remedial” or “lower” tracks. Again, in Savannah’s own words, “It’s a good thing to have two different classes, but not for us in Miss Weaver’s class”.

Elena and Gloria openly expressed their sadness about being in the low-functioning classroom. Elena, in particular and more so than other students, may have had the most difficult time being in the low-functioning group, as her twin sister, Joanna, was a member of Miss Thorton’s class just next door. Yeli, of Miss Thorton’s classroom, during her “Being a Science Student” interview, demonstrated empathy for Elena by shaking her head slowly back-and-forth while looking at the ground and commenting on how “tough” it must be for Elena, “Because, you know, her sister Joanna is in *here* with Miss Thorton”. Elena’s confusion, dejection, and exasperation were

evident when she asked my wide-eyed and genuinely, “It makes me feel sad, because we’re all in the fifth grade, so what’s the deal about that?”

Gloria, while indeed similar to Elena with regard to the sadness experienced as members of the decidedly less prestigious classroom of Miss Weaver, expressed an emotional understanding different from Elena: Guilt. While Elena understood tracking as unfair and unjust, Gloria internalized her positionality and accepted it as appropriate and fitting for a student such as herself to be a member of the low-functioning classroom. Gloria did not question the arrangement itself, instead, she bought in, and in doing so effectively bolstered and reinforced the hegemony. In Gloria’s perception, her placement was *her* own fault, and furthermore, she could have prevented this fate if only she would have acted differently. In Gloria’s own words, “Sometimes I feel sad, because like, I didn’t study hard enough; it’s *my* fault”. The fact that Gloria felt this way, yet also declared, “I’m not challenged in Miss Weaver’s class” is interesting to say the least. She accepted her fate (albeit while not entirely pleased about it), yet she still acknowledged that the classroom to which she had been assigned did not succeed in doing what it was supposed to do (which she demonstrated an understanding of by virtue of venturing to make a comment about it), that is, challenge it’s students both academically and intellectually.

Every student, across both classrooms, believed that the two classrooms were different. When asked about some of the specific ways in

which the two classrooms differed, one of the most prevalent themes that surfaced in the students' responses was the notion of English language proficiency (e.g., reading, writing, and speaking). Seven (26%) of the 27 quotes above mentioned differences between the two classrooms in terms of their different English reading, writing, and speaking proficiencies, or some combination thereof. Six of these seven quotes explicitly mentioned the educational program Read 180, which is intended to help "struggling readers" in grades four through 12, especially in preparing them to raise their achievement scores on English-Language Arts standardized examinations. Unlike the students in Miss Thorton's classroom, Miss Weaver's students used Read 180 everyday on the classroom desktop computers, (n.b., there were eight computers shared among 30 students) quietly and by themselves in the back of the room, to complete a series of reading assignments. For the fifth-grade students of Amblen, Read 180 was a salient symbol, one that when regularly interacted with signified one's positionality as a member of Miss Weaver's class, and therefore, as a less "able", "advanced", and/or "smart" student.

The following slice of school life taken from my fieldnotes captures not only the extent to which there was a preoccupation with English language proficiency in Miss Weaver's class that was simply not present in Miss Thorton's class, but importantly, how this preoccupation translated into science lessons that looked and sounded very differently between the two

classrooms, especially with regard to how “science” was taught as well as how Miss Weaver’s students were not provided with the same opportunities to access the same highly valued skills (e.g., creativity, critical thinking, teamwork, etc.) as Miss Thorton’s students:

> Miss Thorton informs the class that they will be doing their weather reports today, asking for volunteers (10) that wish to present today. Prior to the start of the day’s presentations, Miss Thorton hands me a “Weather Report Rubric”, which she will use to grade each student’s presentation immediately after they present. The rubric contains five categories: “Loud Speaking Voice”, “Hand Gestures”, “5-day weather forecast poster”, “Creativity”, and “Detail and Enthusiasm”. For each of these categories, students may earn a “1- Needs Improvement”, “2- Good”, or “3- Excellent”. Toward the bottom of the sheet, there is a section for “TOTAL Grade/Comments:” as well as a cartoon graphic of a weather reporter (a white woman wearing lipstick, earrings, a blouse, a short skirt, and high heels) pointing toward a weather map of the United States, showing highs, lows, currents, and precipitation.
>
> Samuel is the first to present. Miss Thorton asks him if he would like to be “filmed”. Enthusiastically he exclaims, “Yeah, yeah, yeah, yeah, yeah!” She retrieves her iPad and cues up the video function. Samuel’s props include a large coat, a sun hat, and Rocio’s umbrella (as it turns out, every student eventually uses Rocio’s umbrella during

their presentation, and Miss Thorton comments about this aloud: “Rocio, its good thing you brought that umbrella!”). In order to refrain from redundancies in reporting what each of the students say during their respective presentations, the following describes what each student says and does, as each presentation describes a five-day forecast (each with their own hand-made five-day weather forecast poster) within a particular American city (each student reports on a different city) depicting: Wind direction, wind speed, high and low temperatures, precipitation probabilities, clothing suggestions, as well as the use of three-by-five index cards to guide each presentation. Samuel finishes his presentation with a demonstrative thrust of his arms downward, while confidently proclaiming, “Swag!”

After each presentation, Miss Thorton calls upon three students to provide feedback (i.e., “Three good things that you noticed or liked about their presentation”) for the presenter, while she records each student’s marks on her grading rubrics. Samuel receives the following feedback from his classmates: “Funny”, “loud and clear voice”, and “good eye contact”.

Rocio is the third student to present. Of all the presentations today, it appears that Rocio was not only the most eager to present (smiling the entire time, and presenting with great energy and enthusiasm), but she also seems to be the most well prepared, clearly

having taken great time and thought to prepare her presentation. For example, she references (by holding them up as props) rain boots when predicting heavy precipitation as well as a large coat when predicting very low temperatures. The entire class seems to be utterly absorbed with Rocio's presentation, all watching her with great attention. She signs off by saying, "I'm Rocio Fernandez reporting from New York, and I'm out y'all!" Rocio receives the following feedback from her classmates: "Energetic", "funny", and "super detailed".

Prior to Samuel's presentation, Miss Thorton provides a countdown for him to begin: "5, 4, 3, 2, 1…". Samuel has limited props, but uses the hooded sweatshirt he is wearing as a prop instead. When he mentions that it is about to become cold, he props his hood over his head, and then just as quickly takes it off when he predicts that it will become hotter with more sunshine. He finishes his presentation by shouting, "Peace!" while gyrating his body emphatically. "Oh, Samuel" Miss Thorton laments jokingly, while shaking her head, but still adding, "good job". Samuel receives the following feedback from his classmates: "Funny", "god eye contact", and "good use of props".

Several more students present, and Juan assists each one of them with their props. Miss Thorton refers to Juan as the "prop man", due to his continued role in helping students prepare their props prior to presenting. Miss Thorton encourages him, "You're a good prop man.

Can I come to your big shot Hollywood movie premiere with Brad Pitt, or someone like that?" Juan responds coyly, "Maybe". Miss Thorton then swiftly transitions from science to history, and I leave the classroom to head directly next door to Miss Weaver's classroom to observe their science lesson for the day.

I enter the classroom next door and observe Miss Weaver reading aloud from the students' interactive science textbook, covering topics such as wind and breeze. Almost all of the students have their heads down. They are supposed to be following along in their textbooks while Miss Weaver reads aloud to them. Just after I sit down in a large chair on the left side of the room, Miss Harding enters the room and sits to the right of me. Miss Weaver pauses after reading aloud the word "altitude". "Raise your hand if you have heard of the word 'altitude'" she says. Only five students raise their hands. Miss Weaver explains that "altitude" refers to how high you are above sea level, and uses different heights in mountains as examples. Miss Weaver continues reading "…At night, the direction of the wind *reverses*…" pausing to add, "…that means it goes backwards", and she then repeats this.

Miss Weaver pauses her reading to address a few of the students she perceives to be not properly following along, "If you can't follow along silently, then you will read silently with Miss Schmidt"

[Miss Schmidt is an English-Language Arts instructor, and the students know her as a teacher that you must go see if you have trouble—more trouble than other students—with reading, writing, spelling, speaking, or any combination thereof. Here, Miss Weaver threatens to send students to Miss Schmidt if they are demonstrating deficiencies in any of these areas, but she does so as a form of punishment.

Miss Weaver then proceeds with the reading, but this time employing her often-used strategy of stopping every so often to allow the class to recite aloud the next word in the sentence. Miss Weaver employs this technique as a strategy to assess if students are, in fact, following along with the reading word-for-word. Miss Weaver asks the class, “What is the difference between Valley Breezes and Mountain Breezes?” Jacob raises his hand to answer the question and Miss Weaver calls upon him. He begins to say—while moving his hands in a clockwise fashion in front of his face—“…Because the things…”, but Miss Weaver cuts him off, “What *things*? Use your words,” she instructs.

Miss Weaver then tells the class that they are going to transition to another activity, whereby they will choose a reading partner and then read aloud the passage that the class just went over to each other. They are to take turns and to focus especially on their “reading enthusiasm, punctuation, and fluency”. After all of the students pair up,

Sophie and Gissel ask me if I can help them, so I sit next to both of them, while Gissel reads the passage first.

While Gissel reads aloud to Sophie, and while all of the other pairs begin to read, Miss Harding and Miss Weaver circulate the room to check in on each pair. Gissel and Sophie sit face to face, each with their books sprawled out in front of them. Sophie seems antsy and rubs the pages of her book with so much friction that she actually begins to rub dime-sized holes in some of her pages; she fidgets about, trying to follow along, while Gissel reads to her. Gissel reads the entire passage, albeit with some difficulties, mostly in pronunciation, and the same goes for Sophie, who only has time to read the first quarter of the passage once it is her turn. Some of the words that both girls have problems pronouncing include “relatively”, “altitude”, and “current”.

Miss Weaver then provides the class with a ten-second countdown to quietly return to their seats, ready to pursue the next activity (this is a practice that Miss Thorton’s students to not take part in). Miss Weaver tells them to take out another reading. Again, she tells the class that they will be taking turns reading this passage aloud, as a group. She reminds them, “When we’re reading, we’re focusing on reading fluently and with enthusiasm”.

Line-by-line, she calls upon each student to read aloud the next sentence in the passage. She notes the quickness with which each student begins to start reading aloud, an indicator of how well they are following along with the group. When the word “meteorologist” crops up in the passage, Miss Weaver asks the class, “Who’s a scientist that studies weather?” A few students call out, “Meteorologist!” “Say it!” she enthusiastically encourages to the rest of the class. She then follows up by asking, “How many syllables does that word have, Ramon?” Ramon says, “Four”, but another student calls out, “Six”. “Clap it out”, Miss Weaver orders. The entire class, including myself, Miss Weaver, and Miss Harding, clap out each syllable of the word (a common practice in Miss Weaver’s classroom]): “Me-te-o-ro-lo-gist, six”. Miss Weaver then turns her attention to a few students sitting incorrectly in their seats, “I’m tired of interrupting lessons to remind you to sit correctly in your seats. I’m *this* close to taking away the seats in here and having everyone stand”.

Miss Weaver then continues with the reading by calling on Malina to read the next line aloud, but when she begins she is off the mark by one line. Miss Weaver looks disappointed, “Um, no…Gloria?” asking Gloria to read the next line instead. Malina looks disappointed and puts her head down.

> Finally, Miss Weaver tells the class that they will be finished with this reading for the day, but before she can tell the class what they are about to do next, conversations begin to percolate throughout the classroom. Miss Weaver looks frustrated, “Whenever we transition to new things, you need to learn to turn your voices off. Thank you to the front row for following directions. Thank you to the side row”. Then, returning to a few final instructions regarding the reading, “I want you to read the lines over and over. You don’t have to memorize the lines, that’s a lot to ask of you, and there are other things that are more important, but I want you to read with confidence and to understand what you are reading”. (fieldnotes, December 10, 2013)

The students were not wrong to cite the differences they did between the two classrooms throughout the “Being a Science Student” interviews. Indeed, they *were* different in so many ways. Many times throughout my fieldwork—like in the examples above—having just come from a science lesson in Miss Thorton’s classroom only to sit down no more than a couple of minutes later to observe one of Miss Weaver’s science lessons, I could not help but be struck by how great and vast the differences were between how each group of students was taught “science”. For Miss Thorton, her students were expected to actively engage material conceptually, exercising their individual creativity (e.g., by making presentations, etc.), and to demonstrate their knowledge of scientific content. For Miss Weaver’s students, science lessons

were not really about science at all, rather, the subject of science served as but another medium through which these students were drilled in the importance of learning to read, write, and speak the English language fluently.

Within Miss Weaver's classroom, there was comparatively less review and/or emphasis placed upon *scientific* concepts, creativity, or critical thinking, but rather more emphasis on read aloud activities where students seemed bored, disengaged, disinterested, and unmotivated (or in Gloria's words, "not challenged"). Reviewing the California State Science Standards, both classrooms—as is the case for *all* California fifth graders—are supposed to be gaining a prescribed set of science skills and content knowledge, as well as developing critical scientific habits of mind and practices, yet, the on-the-ground realities of the different ways in which these two classrooms were organized and structured (e.g., privileged activities, expectations, normative practices, values, etc.), *produced* two very different populations of students, with different skill sets and shared perceptions about what it means to be a good science student.

The different experiences these students received translated into greater, or *lesser*, opportunities to access and learn highly valued knowledge and skills. In turn, and as captured by the students' quotations above, these different experiences shaped students' perceptions of self and others, in terms of both ability and potential, including not only their confidence as learners but as *people*.

To avoid redundancies, I will rearticulate a summary of my central research findings, while tying them explicitly to my central research questions, in the beginning of the concluding chapter (see below).

5. CHAPTER FIVE: Conclusions and Implications

5.1. Introduction

This dissertation has been an investigation into the American public education system at the elementary school level. It highlights important factors (e.g., policies informed by deficit discourse, etc.) that shape the organizational structure of schools and classrooms (e.g., the practice of tracking, etc.), and in turn, how they engender disparities in the ways students experience education, namely, in the opportunities that are available to them to achieve and succeed at a high level.

As this dissertation has demonstrated in several ways, tracking—while it might facilitate and streamline the duties and responsibilities for administrators and teachers—ultimately curtails the number and types of opportunities for students to achieve and succeed *academically* as well as *psychologically* in school. This is primarily because the students placed in the lower groups tend to embody understandings of self as inferior, subordinate, *less* capable, and *less* smart, than their peers in the higher groups. Of equal importance is the fact that the students placed in the lower groups are not *expected* to achieve in the same ways that their counterparts are; they are not provided with the same opportunities to succeed.

This concluding chapter also demonstrates how underserved Latina/o youth become institutionalized within our education system. Here, I

synthesize notions of how students *receive* education differently across tracked classrooms, including: The importance of English-language proficiency (both as a marker of intelligence—the rewards of which are distributed to students through opportunities and track placement—as well as a marker of citizenship and a component of identity) and the fates of tracked students writ large, namely, how tracking supports students placed in the higher groups at the expense of those placed in the lower groups. To these ends, I also argue that while there exists a logic behind tracking—at least from an administrative and pedagogical perspective—my empirically-based findings support that it fails to provide *all* students with equal opportunities to succeed meaningfully.

We live in a society that congratulates and privileges success, a society founded on meritocracy. Accordingly, we often understand any one individual's achievements as the culmination of persistent dedication and hard work. This is especially true within our public education system. While these components are undeniably necessary to achieve success, this system problematically tends to ignore and overlook the fact that not everyone is provided with an *equal opportunity* to succeed, perhaps because it might be easier, both financially and logistically, to point the finger of blame at failing *students* rather than a failing *system*. Even more, the momentum of this system is kept rather steady due to a pervasive confirmation bias: We look for cases in which students (e.g., especially students from disadvantaged

backgrounds) have succeeded and achieved great things while going through the rigors of the system, in order to gather evidence that there is indeed nothing wrong with the system itself, but rather, something wrong with those who have *not* succeeded.

It is indeed difficult to admit that something such as our education system—which is supposed to provide all students with equal opportunities not only while *in* school, but to place them in a position to succeed *out* of school as well—could play a sizable role is distributing fortune and misfortune alike. If we truly seek to confirm the theory that education provides *all* with equal opportunity, then we can no longer regard the wealth of data that falsifies it as inconvenient.

Tracked classrooms fail to provide *every* student with an equal opportunity to succeed. How might our education system be better served if restructured in a way that truly provided equal opportunities for all? Importantly, what sets of challenges and obstacles might we face in attempting to restructure the system in this way? Based on the time I have spent going back to the fifth grade, and what I have come to understand as a result of my research, I provide answers to these timely questions.

5.2. Central Research Questions

In what follows below, I address each of my three central research questions in turn and provide answers to them by way of summarizing key

components of my central research findings as they apply to the research questions themselves.

(5.2.1.) Central Research Question (a): In what ways do the division of students into groups (based on ability and behavior) impact the number and types of opportunities for Latinas/os to succeed in school science?

During my time with the fifth-grade youth of Amblen Elementary School, I found that the students in the low-functioning group were not *expected* to succeed in the same ways, and with the same frequency, as the students in the high-functioning group. These expectations manifested in differences in complexity and rigor of daily classroom activities and assignments as well as teachers' praise, or lack thereof, for completing these activities thereby reinforcing different sets of expectations between the two classrooms. In addition, there existed greater peer group recognition and social rewards for *academic* successes in the high-functioning group than in the low-functioning group. I provided evidence supporting these claims throughout Chapter Four (Central Findings) as a series of detailed vignettes showcasing precisely how it was that Miss Thorton's students came to *receive* and *perceive* elementary education in general, as well as the subject of science specifically, differently relative to Miss Weaver's students.

For example, the students of Miss Thorton's class were instructed to take a more *active* role in the learning process—to *produce* materials, in one

case for instance, pamphlets about clouds—while Miss Weaver's students assumed a more *passive* role, engaging in a series of classroom read-along activities, or, memorizing lyrics to a rap song about the water cycle (which, at the time was a topic Miss Thorton's class had completed a few weeks prior), individually and almost never in teams unlike Miss Thorton's students.

For Miss Thorton's students, "science" primarily revolved around the creative engagement with scientific content and ideas, while for Miss Weaver's students, "science" became subsumed by pervading behavioral concerns as well as by a preoccupation with English language proficiency. For Miss Weaver's students, science lessons were not really about science *per se*, but rather, the subject of science served as but another medium through which these students were drilled in the importance of learning to read, write, and speak the English language with greater fluency.

Perhaps the most compelling evidence for the answering central research question (a), that is, in what ways do the division of students into groups (based on ability and behavior) impact the number and types of opportunities for Latinas/os to succeed in school science, came from the students' responses during the "Being a Science Student" interviews. When I asked students directly if they believed "The expectations of the students in one classroom [were] different from the expectations of the students in the other classroom", all but three students believed that what was expected of students

in the other classroom. More specifically, almost all students felt that Miss Thorton's students were expected to learn *more* content, to learn this content *more quickly*, and to *do more* (e.g., be more active, participate more, engage in more group activities such as making various presentations, projects and reports) than Miss Weaver's students. Thus, not only were there objectively greater opportunities, both in number and in kind, for Miss Thorton's students than for Miss Weaver's students, but these shared perceptions also shaped the opportunities to succeed as well in that they helped to inform students' ideas about their individual abilities and aptitudes.

(5.2.2.) Central Research Question (b): In what ways do the division of students into groups (based on ability and behavior) impact how Latinas/os negotiate the concept of "success" in school science?

For the students of both classrooms, to be a successful science student was akin to being a good science student. While there were considerable overlaps, what it meant to be a *good* science student was qualitatively different between the two classrooms. Students in the low-functioning group—more so than the students in the high-functioning group—understood themselves, and other students within their own classroom, as good science students based on behavioral ideals rather than academic ones. Evidence for this claim was ample in the discussion of the results of the "Being a 'Good' Science Student" free-list and rank-order exercises.

The most crucial distinction between each classroom's top-three list of expectations of good science students was that Miss Weaver's students' frequently cited *behavior* (i.e., the demonstration of good behavior, and/or the avoidance of displaying bad behavior [e.g., following *versus* not following classroom rules, etc.]) as an important expectation, while Miss Thorton's students' more frequently cited *intelligence* as an important expectation of good science students.

In addition, the students in the low-functioning group—more so than the students in the high-functioning group—understood themselves, and other students within their own classroom, as good science students based on their respective display of English language proficiency (e.g., Did one: Read aloud and/or write well? Know the correct pronunciation and meanings of science vocabulary? Require special assistance [e.g., from teachers, ELA tutors, and/or other students]? Work slowly or quickly? Etc.). Evidence for this claim had been provided throughout Chapter Four (Central Findings) but was featured most prominently in the "Being a Science Student" interviews when students shared their perceptions about the differences between the two classrooms, especially regarding assistance with the English language. Most prominently, students across both classrooms commonly mentioned how Miss Weaver's students participated in a reading assistance program called READ 180, while Miss Thorton's students did *not* have to.

What *both* classrooms did have in common, however, was that the students' shared perceptions about what constituted being a good science student were heavily shaped by the different *expectations* of and from students, and their teachers, within the respective classrooms. These shared perceptions were held equally by both girls and boys, as there were no significant gendered distinctions in this regard.

(5.2.3.) Central Research Question (c): In what ways do the division of students into groups (based on ability and behavior) impact the ways in which Latinas/os claim and perform successful school science identities?

The students of both classrooms tended to conform (i.e., embody), resist (i.e., oppose), or potentially work to transform (e.g., hybridize) what it meant to be a successful science student with the particular purview of their respective classroom, and these actions were also heavily shaped by the different *expectations* of and from other students and their teachers. The best evidence I gathered for explicitly understanding how it is that the fifth-grade students of Amblen claimed and performed successful school science identities was throughout the course of the "Being a Science Student" interviews.

The "Being a Science Student" interviews gauged the extent to which students understood themselves and their classmates as competent and/or successful science students, in addition to their perceptions of the

difference/s between the two fifth-grade classrooms. In providing detailed descriptions of two students (Elena form Miss Weaver's classroom and Catalina from Miss Thorton's classroom), whom served not only as key informants but as representative case studies, I was able to demonstrate how students conformed to what it meant to be a good science student *differently* within each classroom.

Elena attempted to present an identity as *academically* and/or *intellectually* smart to meaningful others in her classroom, only to be marginalized and ostracized by her peers, instead of being congratulated and praised. Elena's desire to present an understanding of self as capable, confident, and intelligent was interpreted by her peers as "showing off", and so instead of allowing this element of herself to be nurtured, she shut it off and rendered it invisible. Instead, Elena participated in the more socially acceptable activities within the peer-mediated space of Miss Weaver's classroom, that is, English language and vocabulary drills.

Catalina, on the other hand, recapitulated what it meant to be a good science student within the social space of Miss Thorton's classroom quite differently. Catalina's articulate speech, good grades, high level of scientific content knowledge, as well as her perception of challenging schoolwork as something to *look forward to* were all qualities that Miss Thorton's students had learned to display *as* smart students, because they had learned to

distribute to each other social rewards for presenting oneself as *academically* and/or *intellectually* smart.

The social learning that took place within Miss Weaver's classroom was counter to this, as Miss Weaver's students, including Elena, learned *not* to present themselves as *academically* and/or *intellectually* smart, for doing so could marginalize them within the peer group. Instead, these students learned to be good students simply by following instructions and by being well behaved. In this sense, the students were each other's most influential teachers (i.e., Miss Weaver would praise individual students' creativity or ability to grasp content quickly, but one's fellow classmates would not) in that attempts to "show off" were kept in check as such attempts could have threatened the sense of community necessitated by the members of the low-functioning group *as members* of the low-functioning group.

Directly pertaining to how the students of the two classrooms could have claimed and performed successful school science identities *differently*, when I asked students directly if they believed that "one classroom is smarter than the other classroom", every student except one agreed that Miss Thorton's students were "smarter" than Miss Weaver's students, citing many overlapping examples of evidence for this belief. The only student that did not think that Miss Thorton's students were smarter than Miss Weaver's students, felt that neither Miss Thorton's students nor Miss Weaver's students were

smarter than one another. However, *no* student believed that Miss Weaver's students were smarter than Miss Thorton's students.

5.3. Recontextualization of Scale

From the vantage point of the United States, as a modern neoliberal nation-state—given the enormous amounts of capital, energy, resources, and time channeled into financing and regulating education—it remains safe to assume that education is essential for individual as well as social wellbeing (Gradstein, Justman, & Meier, 2004). One's successful movement through the levels of elementary, middle, and high school is continually marked by participation in standards-based evaluation schemes—as the students of Amblen have been and will continue to be subjected to—that render the display of content knowledge to highly-valued institutionalized commodities, which depending on one's access to, can significantly impact one's life opportunities, positioning, and social status (Claussen & Osborne, 2013; Martin & Siry, 2011).

Education in the United States is presently linked to neoliberal economic development strategies, promoted as a banner of progress, and recognized as an achievement of citizenship (Carter, 2005, 2008a; Bencze & Carter, 2011). Indeed, education reform reflects the changing circumstances of the nation's sociopolitical landscape, ever-striving to bolster the nation's

reputation and economic security within a globally competitive marketplace (Tate, 2001).

Problematically, mainstream education policy is still primarily oriented toward remedying educational issues such as underrepresentation by closing the achievement gap (Lee & Luykx, 2006). While it could be somewhat easy to laud this endeavor as a step toward equality, the standardized testing instruments employed to evaluate students have historically benefitted dominant groups with access to capital and resources, and have excluded women and ethnic and racial minority groups, especially Latinas/os (Collins, 2009; Karabel, 2005; Valencia, 2002). In this way, these standardized evaluation schemes play a role in *creating and maintaining* the achievement gap, because they homogenize the interpretation of learning outcomes and perpetuate the myth of schools as spaces of equal opportunity.

In an educational climate where individuals, teachers, schools, school districts, states, and even the nation as a whole, are incentivized and pressured to produce superior test scores, *the* mission of education becomes one of precisely how to attain such scores, often at the expense of all other learning outcomes (Tate, 2001). Inequalities in education persist and seem to mirror broader social inequalities (e.g., residential segregation, etc.), which the underrepresentation of Latinas/os suggests (Alemán, Jr & Alemán, 2010; Castagno, 2008).

The racialized inequality that persists throughout Santa Barbara County (SBC)—which manifests in residential segregation, access to competitive high-paying jobs, and communities' health and nutritional statuses—in turn impacts the demographic composition of the SBC school districts, ultimately results in unequal access to high quality education.

State budget cuts have had debilitating effects on SBC, which have prompted further reductions in spending for infrastructure and human services programs assigned to provide resources to at-risk communities. These communities, which are predominantly Latina/o, have been disproportionately impacted by the changes, engendering even more pronounced levels of impoverishment and hardships in securing resources needed for leading happy and healthy lives.

The city of Santa Barbara is one of four cities in the county identified as a "High Poverty Area" (HPA). The Latinas/os of SBC also suffer from disproportionate levels of poverty relative to all other ethnic/racial groups, and the inequality that falls along racial lines is especially egregious given that a substantial proportion of the county population made up by Latinas/os at 44.1%.

Wedded to the cycles of poverty, and marked by indicators such as income inequality, are levels of educational attainment. Only one in every six adults in a HPA has completed a BA degree, while one in every three has done so statewide (ICCED, 2013). These figures are significant as there is a

very strong relationship between parents' educational attainment and their children's academic success, especially when their children are younger, which in turn shapes opportunities for positive outcomes later on in life, including but not limited to the attainment of college and/or graduate degrees that are strongly correlated to higher earning potential (Palmer, 2009).

Within SBC public schools, Latina/o students are *more* disadvantaged than they are at the state level, while White students are *less* disadvantaged than they are at the state level. SBC Latinas/os, of all ethnic/racial groups, have the lowest percentage of high school graduates enrolled in postsecondary universities at 66% (CDE, 2014). Within student subgroups in SBC, 64.4% of socioeconomically disadvantaged high school graduates have gone on to enroll in postsecondary universities, while that number drops to 48.1% for those students that graduated with the "English Language Learner" (ELL) label (CDE, 2014).

Reflecting the demographic and socioeconomic characteristics of the surrounding communities in which Amblen is located, almost all of the students at Amblen identify as Latina/o, while nine out of every 10 of Amblen's students are deemed socioeconomically disadvantaged, 97% of whom are Latina/o (CDE, 2014). The parents of these students are low-income and are predominantly either first-generation or second-generation Mexican migrants, many of whom speak little if any English.

Given the above considerations, Amblen's decision to divide the fifth-grade students into two distinct groups based on their performed levels of English-language proficiency, as assessed from one standardized examination, does not seem prudent in assuring its' students ascension to upward social mobility via education.

Something is wrong with our education system. The underrepresentation of minorities (most of all Latinas/os) within American higher education and in the scientific workforce is not only a symptom, but also a reliable indicator of the structural inequality that pervades this system. Structural inequalities are more challenging to overcome; at best they are rendered invisible to most, and at worst, they are protected by (even rationalized by) hegemonic discourse. So is the case with education in the United States: The myth of meritocracy is that education is conducted on an "even" playing field, and on this field, the cream is said to rise to the top.

As a nation, rags-to-riches narratives and the like have captured our imagination and coached us into believing that if individuals have not tasted the fruits of success, been admitted into a credible university, or even performed well throughout primary school, it is because they have not *worked hard enough* for it, they have not *earned* it. Perhaps even in other words, they did not *deserve* it. After all, this is exactly what hegemony is, "Power that is achieved through constructing alliances and integrating classes and groups through consent" (Blommaert & Bulcaen, 2000, p. 449).

The dominance of mainstream middle- and upper class White America suppresses the life chances of all other ethnic/racial groups through disenfranchisement, marginalization, and cultural exclusion. For the Latina/o children in our schools, this exclusion is accomplished through the promotion of strict English-only curricula (Unz, 1997), tracked classrooms with Latinas/os *under*represented in the higher tracks and *over*represented in the lower tracks (Carter, 1970; Peng et al., 1995; Valencia, 2002; Zuniga et al., 2005), and the less visible "benevolent racisms" whereby students, teachers, and administrators "help" Latinas/os assimilate to the idealized English-only norms of mainstream middle- and upper-class White America (Villenas, 2001).

Most egregious of all, this hegemony is reproduced, and indeed made even more secure, when the groups that it suppresses buy into the sorts of exclusions that function to suppress them in the first place. With the acceptance of the practices that serve to hierarchically sort entire groups of people within society go unquestioned, taken-for-granted, or even worse still, seen as *appropriate*, the result can only be the maintenance of ongoing cycles of impoverishment and inequality.

While some students *do* rise through the ranks of our education system with great accomplishment and success, why is the great diversity of our nation not well represented in this ascension? Perpetuators of the hegemony—unknowingly or not—assert that the answer to this question lies

in closing the achievement gap. But, are we to believe that if all students performed equally well on standardized exams, underrepresentation would cease to exist? How we choose to frame this issue dictates our avenues for its resolution. The time has come to reframe.

5.4. The Way/s Forward

Within the United States there are systems and institutions that perpetuate inequality in the name of equality of opportunity, but there are also attempts to refute these claims and institute new visions. The country is diverse, education is contested, and the political equation is complex.

While I certainly cannot claim to have the antidote—as I have argued throughout, educational issues are systemic and have no clear point source—my time with the fifth-grade students of Amblen has given me much insight and allowed me to consider several potential interventions that could *help* "even" the playing field, and place greater emphasis on improving the educational outcomes for those that have the most at stake, the children.

The six interventions I have identified include: (1) Strengthening community ties and involvement (e.g., our schools are not islands, they are representatives of the communities in which they function, and they are deeply tied to these communities, thus, we cannot expect to see sustained positive outcomes in any school if the community in which it is situated is struggling—grassroots efforts [such as COPLA mentioned previously] have

been especially productive in engendering positive change within and among communities as well as in developing a powerful voice for those that have been rendered voiceless—strength in numbers can trigger impactful changes in schools and districts otherwise reluctant to change); (2) The inclusion and demonstration of respect for languages other than English in the classrooms (i.e., specifically for Latinas/os, a move away from English-only curricula and instead toward dual-language immersion or bilingual instruction, which could only bolster and support students that come from bilingual homes, and/or where English is their second or even third language); (3) The eradication of tracked classrooms (i.e., while tracking may ease the management duties for teachers and administrators, it only *harms* students, that is, the students placed in the low groups in that they not only receive fewer opportunities to receive the same high-quality and highly-valued knowledge their peers in the high groups receive, but they also tend to have less-empowering perceptions of self as a result of their placement); (4) Alternatives to the business-as-usual conducted in the classrooms (i.e., while it is undeniably beneficial to have a broad "game-plan" with educational agendas, goals, and protocols for achieving these ends, it is perhaps equally important to foster local and context-driven strategies that organize and educate students in ways that best suit particular cohorts and *their* needs based on the sociocultural and socioeconomic contexts in which they operate—one way to do so effectively would be for students' "funds of knowledge" to be carefully considered in

shaping pedagogical approaches); (5) Rewarding good teachers for their effort (i.e., there is not a great deal of prestige associated with teaching in modern American society, especially for individuals teaching in primary and secondary schools in low-income areas, and because the position is grossly undervalued, it is consequentially underpaid, which must change in order for there to be greater incentives for highly motivated, skilled, and qualified teachers to assume roles as the educators and mentors of subsequent generations); and (6) “Thinking beyond the numbers” (i.e., to move away from investing disproportional quantities of capital, energy, and time on standardized testing and to instead shift this investment into a broader portfolio for empowering equitable and positive educational outcomes).

(5.4.1.) Strength in Communities

Our schools are not islands. They are not divorced from the cultural, demographic, financial, political, and social webs in which they are embedded. As such, we must adjust our expectations about what schools can realistically achieve accordingly. For instance, we cannot assume that a school serving a severely impoverished community—with high rates of child obesity, malnutrition, crime, and a lack of long-term equitable employment opportunities, to name a few demographic indicators—has an equal chance, or even a relatively “good” chance, of flourishing and thriving as does one from a comparatively socioeconomically advantaged community.

Our schools mirror the contexts in which they operate, and to a certain extent, we cannot reasonably expect underperforming schools, such as Amblen (Amblen recently emerged from a five-year stint on the Federal Intervention Program Improvement [PI] for failing to make Adequate Yearly Progress [AYP] for the overall percentage of students achieving "proficient" status in English-Language Arts [ELA], currently at 50% [CDE, 2014]), to completely ameliorate their situation unless long-term sustainable changes are made with regard to the material conditions of the community in which Amblen is located. Having said that, however, this does not mean that there are not very meaningful measures that can be taken to improve the quality of the educational experience for all families that send their children to Amblen.

Most notably, communities have the power to mobilize and to form a collective, organized, and unified front, one that gives voice to their most pressing concerns. Most notably, recall the efforts of COPLA (*Comité de Padres Latina/os*) (Delgado-Gaitan, 1996) in Carpinteria, California. This committee was able to carve out a productive space whereby concerned parents could remain permanently involved in the academic lives of their children by cooperating to instill and oversee specific changes—for example, in "English as a Second Language" (ESL) curricula, the hiring of bilingual educators, ensuring school correspondence in Spanish as well as in English, etc.—which ultimately led to greater school success and a more enriching educational experience for many Latina/o youth as well as their families

(Delgado-Gaitan, 1996). These concerned parents organized grassroots efforts to broaden and deepen the channels of communication between themselves and the schools within the Carpinteria School District. The capacity to enact this sort of change is available within every community, and this certainly goes for the communities of “invisible” Santa Barbara.

Mobilizing efforts in Santa Barbara with the express aim of achieving social justice already exist, such as Just Communities (*Comunidades Justas*), which offers an analog of sorts to COPLA: Parent Involvement through Dialogue & Action (PIDA). With the goals of increasing academic opportunity for all students, PIDA actively strives to strengthen the parent-school bond as a means to increase the transparency of school practices and to facilitate a deeper understanding of the metrics used for measuring students’ success as well as the means for achieving them (Just Communities, 2015).

Because our schools are inextricably tied to the communities that support them, they are (unfortunately) also inextricably linked to the structural inequalities that plague some of our communities. In the face of adversities such as these, it is often necessary for communities to exercise their collective agency to counteract, or try to make up for, the relative lack of access to high-quality opportunities for students and their families.

(5.4.2.) Respect the Language

Within our public schools, Latina/o students are generally positioned unequally to White students on the basis of language, but specifically, in their mastery of the English language (Olsen, 1997). It is easy to interpret the privileging of English over any other language, especially Spanish, in the classroom as systemic discrimination and disenfranchisement of Latinas/os whereby language has come to serve as a stand-in for race (Gutiérrez & Jaramillo, 2002; Monzó & Rueda, 2009; Revilla & Asato, 2002; Valencia, 2002; Villenas, 2012). Furthermore, this practice is the result of hegemonic ideologies veiled in the rhetoric of progress and unity (e.g., “One nation, one language” [Lang, 1995]).

For Latina/o youth and other minority students, understanding oneself within the sociocultural context/s of school often involves an exercise of viewing oneself through the lens of powerful others (e.g. teachers) and members of dominant groups such as native English speakers (Monzó & Rueda, 2009). Because of what have been understood to be language “barriers” or cultural “differences”, many Latina/o students experience prejudice and less recognition from meaningful others as competent individuals capable of succeeding in school (Valencia, 2002).

What is more, Latina/o students seem to be aware of their differences and experience pressure to fit in to the social fabric of the school classrooms (Olsen, 1997). Of course, “fitting in” implies the existence of a cultural ideal

type (Dennis Korth, 2007), or an ideological standard to which everyone else is judged in relative degrees of similarity, or in Latinas/os' cases, difference.

Public schools in the United States tend to operate under the assumption that educational implementation and evaluation—and the theories used to support them—are neutral and universal; that they do not put some students at a distinct advantage while putting others at a distinct *dis*advantage (Paris, 2012; Siegel, 2006). Proposition 227, a primary example of this, promoted the slogan "Let's teach English to all of America's children and end bilingual education nationwide" as part of the "One Nation/One California" campaign, insisting that *the* solution to closing the achievement gap would be the immediate and "structured English immersion" for all English Language Learners (ELLs) (Unz, 1997). Such policies and practices have been shown to further disadvantage Latinas/os and by limiting their access to sufficient opportunities and resources necessary to excel in school (Callahan, 2005).

By privileging Englishin the classrooms—and by extension, the studetns that can read, speak, and write it better than other studetns—a dynamic is thus established whereby it becomes easier (even *necessary*) to divide studetns into separate (and *un*equal) groups: Students that are English proficient on one side, and students that are not or less proficient on the other. Indeed, students' levels of English proficiency are widely used to make track placements for *all* school subjects, and this is especially true of tracked

and ability-grouped primary school classrooms, where one teacher is responsible for teaching students all of the core subjects (e.g., English, history, math, science, etc.). The practice of grouping students on the basis of their command of the English language is based on the assumption that most subjects are “vocabulary intensive” (Zuniga et al., 2005).

Given the privileged status of English in schools, it is unsurprising that English Language Learning (ELL) Latina/o students are often placed in lower tracks in ethnically/racially diverse schools. But what about schools that implement tracking, such as Amblen, wherein all of the students of the fifth grade identify as Latina/o? In their case, they *too* have been tracked on the basis of their ability to demonstrate that they are “proficient” in their use of the English language. For schools like Amblen, the division of students into two classrooms is may not readily be interpreted as a practice with any *racial* implications, but for schools with greater ethnic/racial diversity, when tracking results in minority youth being overrepresented in the lower tracks, these students come to embody feelings of difference at best and inferiority at worst. Crucially, while the fifth-grade student body of Amblen was not racially diverse, what was most important and cannot be overlooked was that the students in the lower track still experienced similar feelings of difference and inferiority relative to their peers in the higher track.

At Amblen, and for the fifth-grade students that required “help” with their English (all of whom were members of Miss Weaver’s classroom), being

known as one of these students operated as a marker of inferior social positioning (e.g., these students were understood to be less “cool” and or less “popular” than students that did not receive “help”, such as the students in Miss Thorton’s class). Further, some students’ feelings of inferiority and inadequacy ran deep enough that they understood as them “disabilities”. One day in Miss Weaver’s classroom, the students engaged in a discussion about disabilities, and they had to construct a poster displaying three categories of information: What they feel they already knew, what they did not know, and what they had learned about disabilities. One of the students’ group posters was constructed as such:

What I know

- Physical disability –arm –leg
- Social disability –being very shy
- Autism –mental disability
- Dyslexia

? [What I don’t know]

- Is anger a disability?
- Why do people have them?
- Can you fix disabilities?

What I learned

- Everyone is different
- Everyone can learn

This discussion of disabilities was most certainly an important one, especially with regard to the knowledge students acquired within the credible and formal learning space of the classroom, as to what disabilities *are*, *who* has them, and how this impacted their notions of self. Especially pressing were the students' questions about disabilities (e.g., "Is anger a disability?", "Why do people have them?", and "Can you fix disabilities?") Implied by their questions, students perceived disabilities as inherently *bad* things. Perhaps most troubling though, was the discussion of "social" disabilities, with "being very shy" cited as an example.

In my time spent with the students of Miss Weaver's classroom, many of them had displayed the attributes of "shy" people and frequently within the context of displaying one's English proficiency within group settings. I understood this shyness as acts of "'Passing', [or,] strategies to appear more competent in English than was actually the case…passing for English fluent may be both a strategy of self-preservation [i.e., to protect oneself from feelings of shame] and a form of resistance" (Monzó & Rueda, 2009, p. 20).

In Miss Weaver's classroom, passing was accomplished in several ways: (1) By providing an affirmative response and/or not asking teachers for clarification on instructions despite the fact that they had not been fully understood by every student; (2) By not asking Miss Weaver to speak more slowly or to repeat herself; (3) Mumbling or reading very quietly on purpose during read-aloud activities so that Miss Weaver would not detect

pronunciation “mistakes” (this was probably the most frequently utilized passing strategy in Miss Weaver’s classroom); and (4) Appearing busy so as not to get called upon. These strategies employed by Miss Weaver’s students were similar to those employed by various other Latina/o students attempting to pass as English proficient, such as those documented by Monzó & Rueda (2009).

In one sense, students’ perceptions of shyness as a disability, as well as their energetic investment in employing passing strategies was not so surprising given that English language competency was privileged and regarded as *the* central activity within Miss Weaver’s classroom. While Miss Weaver’s students clearly experienced pressure to perform as English proficient, it remains not only Miss Weaver’s students that would benefit from Spanish receiving an equally prominent role in the classrooms; Miss Thorton’s students would stand to gain a great deal from such as change as well. This is, in part, because of what English and Spanish—and the people that speak these languages—have come to represent.

Deficit-model explanations used to evaluate minority students’ underachievement in school often imply—or claim outright—that these students come from culturally-deprived communities (Bulmer & Solomos, 2004; Villenas & Deyhle, 1999), which do not provide them with the tools necessary to achieve school success (Castagno, 2008; Collins, 2009; Monzó & Rueda, 2009; Van Eijck & Roth, 2011; Wortham, 2008). This belief is

especially troubling in that it renders the application and performance of certain cultural beliefs, practices, values, and *language* that students bring with them to school, not only inappropriate, but incompatible with achieving school success (Sampson, 1993; Zuniga et al., 2005). Despite the calls for "multicultural education", a more inclusive learning environment whereby diversity is celebrated and seen as a strength rather than a weakness, in practice, culturally and linguistically diverse groups of students are still evaluated and rewarded on the basis of how well they have assimilated into the sociolinguistic and normative practices of the English-speaking White middle class (Aikenhead & Jegede, 1999; Brown, 2004; Lee & Luykx, 2006; Tan & Calabrese Barton, 2008b).

(5.4.3.) Equal Classrooms = Equal Opportunities

Scholars invested in educational equality maintain that the tracking of students is neither an unrelated precursor to, nor a viable solution for, the achievement gap but rather part of its *cause* (Oakes, 2005; Peng et al., 1995; Tan & Calabrese Barton, 2008b). If Latinas/os are *under*represented in the higher tracks, it is *because* they are *over*represented in the lower tracks, a trend that has been decades in the making (Carter, 1970; Peng e al., 1995; Valencia, 2002; Zuniga et al., 2005). In many ways, the placement of Latinas/os in low track classes can be a self-fulfilling prophecy: When it has been suggested to students, by their placement in lower tracks, that they are

neither as capable nor as smart as the students in the higher tracks, it should not be surprising that their test scores remain low; they are not *expected* to succeed in the same ways as the students in the higher tracks. My empirical findings presented throughout this dissertation support this contention.

At 15.1%, Latinas/os have the highest high school dropout rates of any minority group (NCES, 2012). Students that have been placed within the lower track classes (which are disproportionately minority students)—a process that begins in elementary school and has lasting and progressively more significant consequences through high school—tend to have higher dropout rates, are more likely to engage in criminal activity, and enter vocational schools with much greater frequency than do their counterparts placed in the higher track classes, who go on to attend four-year universities with much greater frequency (Goodlad, 2004; Oakes, 2005). Such problematic trends are not just *educational* problems, they directly contribute to systemic socioeconomic inequalities faced by many minorities and other marginalized groups, and are therefore fundamentally *democratic* problems.

While tracking does not strictly *prohibit* any one student from succeeding or attaining a high-school diploma or a bachelor's degree, it also does not *facilitate* the process of degree acquisition for those placed in the lower groups, if anything, it makes their journey much more arduous and obstructed. Because of Latinas/os' disproportional representation in the lower groups, many Latina/o educational scholars have begun to think of tracking

as form of neo-segregation, or, “resegregation” (Valencia et al., 2002). Since *Brown v. Board of Education* (1954), what is at stake in education is no longer the right to a shared “physical space”, but to a truly *equal opportunity* to learn the same highly valued knowledge (Tate, 2001).

At Amblen, the students of the fifth grade were not within tracked classrooms at *every* moment. During their weekly “rotations” in art, music, and science, equal numbers of students from Miss Weaver’s classroom as well as Miss Thorton’s classroom were shuffled and reorganized into three rotation groups consisting of approximately 20 students each. During their hour-long science sessions with Mr. Benzen, students from both classrooms were made to collaborate with one another, help each other, and participate in various other activities. Most compelling of all, during these times there seemed to be no significant observable differences between the students of either classroom in terms of ability. In other words, without prior knowledge as to which students were members of which classrooms, a casual observer would find it difficult to identify students of the “low” or “high” functioning classrooms, respectively, based on their activity and participation alone during the weekly science rotations. What this suggests is that this particular cohort of students need not have been divided in the ways that they were, because when the students from both classrooms were intermixed, any differences in “ability” seemed rather negligible.

Every student has the ability to rise to the academic challenge—what is more, they should have the *right* to be given a chance to rise to the academic challenge—they may require the proper scaffolding, but this is where teachers play an integral role.

(5.4.4.) Alternatives to the Status Quo

It is important to recognize the reality of needing a well-organized approach to implementing educational agendas in the classroom. Doing so entails having clear benchmarks and goals for what it is that we want students to achieve. Irrespective of precisely *what* it is that we want them to achieve (which is the basis of section [*(5.4.6.) Thinking Beyond the Numbers*]), what is perhaps even more important is that we take up more stake in *how* we go about accomplishing these ends.

We must not assume that our educational goals can be attained with a relatively one-size-fits-all strategy; in other words, we must take seriously the power of *context*. Our students are not homogeneous, so neither can be our content delivery and/or pedagogy. Who our students are, where they come from, the language/s they speak, what their family lives are like, their gender, and sociocultural and socioeconomic backgrounds *matter*. To educate our youth more efficiently and effectively, we must tailor our educational implementation strategies in the classroom to *their* lived realities, and not the

other way around. Doing so, requires that we take seriously their “funds of knowledge”.

In alignment with tenets put forth by the funds of knowledge scholars, we must recognize that neither individual students nor the cultural and familial backgrounds they come from can expalin patterns of academic underachievement, but rather, if we see that studetns are failing to hit the benchmarks we prescribe, we must honestly ask if our schools are giving voice to the diverse culutral backgrounds and linguistinc practices of *all* students, without which curtails their opportunities for success.

Further, if equal vaule was to be placed on students’ cultural experiences and sociolinguistic practices (i.e., their funds of knowledge), this would translate into a *greater* likelihood in them achieving academic success (González et al., 1995; González et al., 2005; Moll et al., 1992). For Amblen as well as many other schools like it, if important elements of Latina/o students’ cultural identities (e.g., the languages they speak, the foods they eat, the holdiays they celebrate with their families, etc.) were valued equally in the classrooms alongside the cultural practices of the dominant and mainstream White middle-class, then these students, previously disenfranchised, exluded, and perhaps made to feel inferior, could feel more motivated to achieve academically, because they would feel like they are a part of a commuity in which they are included and empowered.

In schools such as Amblen, which are predominantly Latina/o, it should be a necessity, for example, that the teachers and administrators speak Spanish. Not only would teachers be able to achieve their goals more effectively, because they would experience greater communicatability with the students, their parents, and their families, but importantly, students would be better served as a result. If this was the case, there would undoubtedly be greater rapport established not only between students and teachers, but between the school and the community as well.

Many of the students' parents speak little if any English, and thus having a staff of teachers that can communicate and empathize with parents, families, and community members both within and outside of the classroom has the potential to establish a common ground, trust, and understanding, and a greater likelihood of improving educational outcomes—whatever they may be—as students, their parents, teacher, and the school can begin to truly be on the same page.

Within a predominantly Spanish-speaking community, it only makes sense that the schools in which parents are sending their children hire teachers that can speak Spanish as well; it is more than a sign of respect, it is simply good ethical practice. There would be no need for translators (as there are now) present during quarterly parent-teacher conferences so that the two sides can communicate effectively.

Appreciating the power of context (e.g., community demographics) must be a central component in determining who works in our schools, how classrooms are organized, and how the school and its various representatives communicate and interact with its students and their parents and families.

(5.4.5.) Reward the Teachers

In my time spent with some of the students, teachers, and administrators of our schools, I have learned that to achieve truly equitable outcomes in education, it is crucial that we invest more in our teachers. Teachers harness the capacity to empower our youth and to help them actualize their potential, but they need more support—both personally and professionally—to do so effectively. This could not be any more crucial, because teachers shape how students perceive themselves as learners and doers in school, which impacts learning outcomes, achievement, and students' perceptions about accessible, achievable, and appropriate futures. We must empower our youth. To do so, we need to align them with excellent teachers who can provide them with the appropriate mentoring, tools, and scaffolding necessary to excel.

For the 2012-2013 academic school year, the average beginning teacher annual salary for a "small" unified school district (i.e., a regular annual average daily attendance of less than 1,500 students) in California was $38,152, while for the largest unified school districts (i.e., a regular annual

average daily attendance of more than 20,000 students) in California it was $41,761 (CDE, 2015). Santa Barbara Unified School District (SBUSD) has a fairly large student population at 15,518 (CDE, 2014). As beginning teachers within a school district of this size, it is safe to assume that Miss Thorton as well as Miss Weaver, both beginning teachers, each earn approximately $40,000 per year (CDE, 2015). Compare these figures to the school principal, Ms. Carmille, who earns approximately $105,000 per year, as well as the District Superintendent who earns approximately $205,000 per year (CDE, 2015).

What are we to conclude about figures such as these? Perhaps most obviously, one may conclude that elementary educators are not particularly well valued, as they are not comparatively well rewarded (financially) for the services they provide. Miss Thorton had obtained a Master's Degree in Education, and because of this, she is paid only an additional $800 per year. It is worth noting that California boasts the nation's fifth highest average annual salaries among public school teachers, behind only New York, Massachusetts, the District of Columbia, and Connecticut, in that order (CDE, 2015).

Of all of California's state-level education funding programs for the 2014 fiscal year, totaling $3,962,555,262, just 6.4% ($255,403,182) of this money was estimated to go toward teaching efficacy in the form of Improving Teacher Quality State Grants (USDE, 2014), while no other funding source

was directed toward teacher improvement in any way. Having consulted Miss Thorton and Miss Weaver directly about the subject of state education funding and teachers' annual salaries, they felt (as do so many other teachers) that funds would be so much better spent on bettering our teachers in an effort to provide better and more specialized attention to students. For instance, hiring more motivated, passionate, qualified, and well-prepared teachers to reduce the student-to-teacher ratio in classrooms.

Miss Weaver oversees 30 students for the better part of eight hours per day, five days per week, while Miss Thorton oversees 33 students for the same amount of time. Because of the demands place upon teachers, their time is stretched very thin, often struggling to keep their heads above water, so-to-speak, and this is especially the case for beginning teachers. In an after-school conversation that I had with Miss Weaver near the end of the school year, she confided in me the hardships she faced as a first-year fifth-grade teacher:

> Once all of the students have left the classroom to go home for the day, Miss Weaver dramatically slams her head down on her desk in an effort to show just how exhausted she is. Miss Harding and I laugh, and Miss Harding apologizes to Miss Weaver for not being present earlier in the day. Miss Weaver jokes, "I am *really* upset with you. No, it's totally fine. To be honest, I didn't even notice, because I have like 50,000 other things on my mind right now". Miss Harding appears

> relieved, and tells Miss Weaver that she will be back tomorrow, and she then leaves. I begin talking to Miss Weaver briefly, and we discuss when we can have our end-of-the-year pizza party for the students, and she tells me that we can do it on the second-to-last day of the school year, on a Thursday afternoon. We tentatively pencil in this date on both of our calendars. Suddenly, her mood changes, and after thinking about something for a moment, she confides in me that she is "Just so ready for the school year to be over". When I mention to her how hard it is to believe that there are only three weeks left in the school year, she looks slightly distressed and she tells me, "Its just that, I am *so* ready to have a new group of students, you know, a fresh start". When she sees the confusion in my face, she proceeds, "Its not that I don't love my students, I do, its just that, this was my first year teaching the fifth grade, and I made so many mistakes that I have learned from, and I will do better next time." (fieldnotes, May 15, 2014)

In the United States, over 200,000 new teachers enter the teaching profession every single year, and over 10 percent of them do so in California (Goldrick, 2013). Because of the high teacher turnover and the growing student-to-teacher ratios, it is very difficult for students to receive the individualized attention that could propel them to succeed not only academically, but personally as well. For our young students, especially those in K-12 schools, teachers have the opportunity to serve as one of the most

important and influential mentors and motivators in their lives. Of course, because they have been granted the opportunity to enact this positive change in the lives of youth, they also have the opportunity to *fail* to be an influential mentor and motivator, or even worse, to be just the opposite.

Teaching is a demanding job, a difficult job, and it is an extremely important job. To state that teachers are "overworked and underpaid" is an understatement. As other teachers whom I have talked to corroborated, Miss Weaver and Miss Thorton told me that a significant amount of their time "on the job" is spent in *preparation* for the coming schooldays and school weeks ahead, most of which they tried to accomplish from the confines of their homes, and usually only *after* they had returned home from a full day of teaching (both Miss Weaver and Miss Thorton estimated that they each get approximately just a couple of hours of personal time every day). Because this preparatory labor occurs primarily within the private sphere, this labor is rendered *invisible* and thus receives no compensation.

Both Miss Weaver and Miss Thorton estimated that they regularly put-in well over 60-hour workweeks, yet they were never paid overtime. There exists a common misconception that teaching (and again, especially at the elementary school level) is an "easy" job. Contrary to popular belief, teachers do *not* get weekends or summers "off"; they are always planning and always preparing, or at least they *should* be (while this invisible labor is not part of their official job description and/or duties, they are still tacitly expected to

comply), for if they do not, it remains primarily their students that suffer as a result.

American society fails to reward teaching (and especially the teaching of elementary-aged children) with either social prestige or financial compensation. And in inner-city schools and/or schools whose students come from low-income backgrounds such as Amblen where motivated, passionate, qualified, and well-prepared teachers are *most* needed, it remains these schools that continually receive the least funding, and have the highest teacher turnover rates. In our society, there is a greater financial incentive—as well as cultural incentive—for our driven, dedicated, passionate, and smart individuals to want to pursue professions in business, law, or medicine, but rarely for teaching in K-12 settings. It is difficult to blame them. We must provide greater incentives for teachers to keep teaching, as well as for motivated individuals to pursue teaching as a potential career path if we are to reduce the student-to-teacher ratio as well as the teacher turnover rate, if we are to provide better classrooms with greater continuity for our students.

(5.4.6.) Thinking Beyond the Numbers

What, precisely, is *the* purpose of education? Is the true purpose of school to *educate* the masses? If this is true, then it assumes that "knowledge is power", whereby the acquisition of credible content knowledge can empower individuals to make better (i.e., more informed) decisions that can

help them to lead happy and healthy lives as productive and well-adjusted members of society. Or, is the purpose of education to establish and then perpetually reproduce a class of elites? Asked another way, “[Is] education…a source of progressive change or… must it inevitably reflect and reproduce existing ways of thinking, doing, and dividing the spoils”? (Lauder, Brown, Dillabough, & Halsey, 2006, p. 6). The answer to this question can be found in analyzing how we choose to go about our educating. After spending much time in the classrooms of our schools, if I am to answer this question on the basis of what I have *seen*—as opposed to what I have been *told*—then I am inclined to say that while education might provide *both*, it currently provides more of the latter and, unfortunately, less of the former.

Within the culture of the American education system—and indeed as it is in the professional world of the public sphere—we conduct ourselves, and teach others to conduct themselves, to be chronically afraid of being wrong. Within education especially, we reward students for knowing the "right" answer, and shun anything that is “wrong”. Instead, we should be rewarding students for questioning *why* a particular answer is right. We should reward the critical and creative *process* of thinking, and not simply the *result* of this process, which is either a correct or incorrect answer. When we teach content knowledge to students, we do not only teach them “correct” content knowledge; we *teach* them to be afraid to be *wrong*. However, it is only through the process of making mistakes (i.e., being wrong), and then learning

from said mistakes, that the greatest strides in creativity, growth, and innovation can flourish. To be afraid to be wrong is to be afraid to think, it is to shy away from critical engagement and to shy away from questioning what we *think* we know or why something must be done in a particular way.

We teach students in this way because we are a society obsessed with numbers and rankings. The creation of standards-based evaluation schemes—internationally recognized as the indicators of successful learning outcomes—render content knowledge, and its display within institutionalized forms (e.g., standardized examinations, etc.), to highly-valued commodities, which depending on one's access to, can significantly impact one's life opportunities, positioning, and social status (Claussen & Osborne, 2013; Martin & Siry, 2011).

In an educational climate where individuals, teachers, schools, school districts, states, and even the nation as a whole, are incentivized and pressured to produce superior test scores, *the* mission of education becomes one of precisely how to attain such scores, often at the expense of all other learning outcomes (Tate, 2001). We must not simply attend to *what* students learn or the scores they attain, but in addition, the conditions that guide and shape *how*, *when*, and *why* diverse groups of students are motivated to achieve and learn about content and themselves in meaningful ways.

The following excerpt was taken from a conversation with Miss Weaver about this very topic and captures her own sentiments quite well, illustrating

some of the unique challenges she faced as a teacher. She cares for her students and wanted to do right by them as developing individuals, and yet, she was also expected, by the school administration, to get all of them to achieve certain proficiency levels in their standardized tests. Her internal conflict about reconciling the two objectives is evident here:

> Miss Weaver shares with me some of what she has learned about the personal lives of a few of her students, while connecting it to our previous conversation about the notion that these children are more than just numbers (i.e., they are more than just "low-functioning" students), and how we should take the time to understand *why* they are performing "poorly" in school. In addition, we discuss how we should focus on some of their individual strengths, and not simply how well they can listen and/or follow directions.
>
> Miss Weaver elaborates, "Take Chris for example, he is probably the most self-aware kid I have ever met. He wants to do well when he comes to school, but he feels like he can't. Like, take his diet for example. He knows that when he eats a lot of sugar, he will not be able to focus, and he will be angry. Like, take the other day for example, he told me right when he came into school, 'Miss Weaver, today's not going to be a good day, I ate a Pop-Tart, a glazed donut, and chocolate milk this morning.' He knows that if he has too much sugar in his body, he will be in a bad mood, and that it will be hard for

him to focus in school. And the thing is, his parents can't provide any better for him. Chris and I have an understanding now, and while it can be difficult to deal with him sometimes, because he likes to call out in class to get a rise out of his fellow students, I feel like we understand each other. Like, one day he was *so* angry, and so I asked him, 'Chris, are you angry with me?' And do you know what he said? He said, 'No Miss Weaver, I'm not angry with you, I'm angry with my mom'. I mean, this kid is just *so* self-aware."

I interject, "You know, why can't we, meaning the educational system, see and reward qualities and attributes like this? Why can't we reward students like Chris, and provide him positive reinforcement for being in touch with himself—a very valuable real-life quality that many 50-year-olds do not have—instead of whether he knows how to answer math questions on a test correctly?" Miss Weaver is smiling wide and nodding her head enthusiastically.

She also shares with me stories about Malina, and how on the surface, it may seem like she is just an underachieving student who does not care about school. But there is much more to her story, just as there is so much more to many students' stories, and that we should not simply label a child as "deficient" or "problematic", but rather, we need to understand the *context* in which this person is not succeeding.

Miss Weaver provides for me some of the context for Malina:

> "She is very shy. She is so afraid to participate in class, because she is so afraid of saying the wrong answer. But, that's not what she is like at all *outside* of class. She is very talkative and energetic, and wants to be friends with the others. I get it though, you know, I mean, it *is* a little harder for her because she is a little bigger, and a little taller than the rest of the kids. She has two older sisters, who are very pretty and popular, and they give her such a hard time; they treat her like shit, because they can. Her parents, on the other hand baby her because she is the youngest in the family. One time, I kept Malina after school to help her with some math homework, and her two older sisters were right outside of the classroom window, and when they became impatient in waiting for her, they started yelling inside to the classroom, 'Come on Malina! Malina, let's go!' And they would not let up. Now, they are banned from Amblen school premises because of their disruptive behavior." (fieldnotes, February 20, 2014)

Stories such as those about Chris and Malina above highlight the trouble with labeling any one student as "low-functioning" just because they had not received a particular score on an exam. For one, doing so effectively renders their individuality *invisible*; the label itself marks their membership within a homogeneous group and subsumes their individual identities. If we truly do wish to see *every* student succeed in school, then we should become more

invested in understanding *why* students fail to achieve a certain mark on a test. We must understand these so-called shortcomings within *context*.

Understanding the context within which Malina feels too embarrassed and/or intimidated to participate in class (even though she is *more* than capable of successfully doing so) could help her teachers to locate the appropriate triggers to help her succeed in school. Additionally, as demonstrated by the story of Chris, we must learn to reward and value students' abilities and attributes other than those that are directly transferrable to achieving good grades. Chris does not receive good grades in school, yet he is remarkably self-aware, a skill that will serve him well (much more so than knowing if a rhombus has parallel sides of equal length, for example) for the remainder of his life, yet this is an ability that will go undervalued and unrewarded within the halls and walls of the schools he will attend for years to come.

Focusing less on *numbers* and more on *context* is crucial for ameliorating underrepresentation and for improving educational outcomes for all. As I have demonstrated throughout this dissertation, to better understand some of the mechanisms of underrepresentation, we must look *beyond* the numbers, and investigate the role of schools—their organization and their structure—in the perpetuation of underrepresentation, and particularly, how they shape students' experiences and opportunities to succeed.

5.5. Concluding Thoughts

This dissertation operates at the confluence of notions about class, gender, language, and race, especially as they revolve around the implementations and interventions of K-12 public education in the United States and the hegemonic meritocratic discourse on which it is founded. Within the current educational climate, underrepresented minority youth are often perceived as having cultural and sociolinguistic deficits that need to be corrected, and this is especially true for Latina/o youth (Delgado-Gaitan, 1992; Foley, 1997; Hogg, 2011; Valencia, 1997).

As I have demonstrated throughout this dissertation, the reduced expectations (from peers and teachers alike) placed upon students in low-functioning groups have the effect of reinforcing negative perceptions of self among these students, which can be truly debilitating. The implications for greater equity are clear: The ways in which students perceive themselves as learners and doers—and how others perceive them in these ways—shapes their actions, or inactions, in school thereby impacting learning outcomes, opportunities, and perceptions about accessible, achievable, and appropriate futures.

Tracking is an outcome of deficit discourse-informed policies to remedy the achievement gap, the closing of which is a seemingly well-intentioned (albeit misguided) strategy for ameliorating underrepresentation. The problem with this chain of logic is that instead of ameliorating underrepresentation, it

can only perpetuate it. Such problematic trends within our education system are not just *educational* problems, they directly contribute to systemic socioeconomic inequalities faced by many minorities and other marginalized groups and are therefore fundamentally *democratic* problems.

As Americans, we claim to live in a society that is both fair and just, and one pillar of our society wherein we believe we truly foster this vision to bloom is in our education system. Part of the reason so many of us believe this is so is because we *have to*; we cannot simply allow ourselves to believe that in a nation founded on the principles of equality, freedom, and justice, that our education system (something which almost everyone would agree is all but essential to improving one's life chances) could be pervasively *un*fair and *un*just. After reading, researching, thinking, and writing extensively about this topic, as well as from the time I have spent with some of the students and teachers in our schools, I can only conclude that our education system is just that: *un*fair and *un*just.

To be clear, tracking is not the sole manifestation of this, but it is indeed an important avenue that requires change. As I have argued throughout this dissertation, tracking is unjust because it fails to provide *every* student with an equal opportunity to access the same highly valuable content knowledge, institutionalized capital (e.g., tests, qualifications, etc.), and ultimately, the credentials necessary to get ahead in life (Claussen & Osborne, 2012). I believe that the eradication of practices such as tracking

can only benefit those individuals previously thought to be incapable of achieving a certain level of academic success.

Improving education through seeking to foster diversity as well as my own personal commitments to equity and social justice are the manifestations of how I define myself as a scholar, a teacher, and a person. Those working to increase diversity and ameliorate underrepresentation must also seek avenues for accomplishing this goal long before students ever set foot on a college campus. If minorities are not well represented in universities and in the workforce, it is because they are also systematically disadvantaged and disempowered in *every* educational venue preceding these stages, and this includes elementary schools. Many of the students with whom I worked will be fighting for their places in our universities just seven years from now. It will remain my hope that they envision college as an accessible and desirable place to be.

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APPENDIX

"Being a Science Student" Interview Protocol (English)

- Do you want to go to college someday?
- Why or why not do you want to go to college?
- What would you like to study in college, and why?
- Where would you like to go to college?
- Do you think you have a good, not so good, or in the middle chance of going to college, and why?
- What kind of job would you like to have when you are older, and why?
- Does the job you want to have use science? If so, how?
- Imagine you meet someone from another planet, and they tell you that they can read some of our words, but that they have no idea what they mean. If this person came up to you and asked, "What is 'science'?" What would you say?
- If this person then asked you, "Who are scientists, and what do they do?" What would you say?
- Finally, if this person said, "It seems like you humans use science on you planet, but I'm not sure how, or for what. What do you use science for?" What would you say?
- Do you like science? Why or why not?
- What do your teachers expect of you when you are learning about, or doing, science?
- Do you think your teachers have similar or different expectations of you when you are leaning about subjects other than science? If so, how?
- Is there anything special about science students—things they do or say, or the way they act, behave, look, or speak—that is different from any other kind of student (for example, history students or math students)?

- What is your favorite subject in school, and why?

- What is your least favorite subject in school, and why?

- What is your best subject in school, and why?

- What is the subject that you have the most difficulty in, and why?

- From the very beginning of the school day, to the very end of the school day, what is your favorite part about being in, or coming to, school, and why?

- From the very beginning of the school day, to the very end of the school day, what is your least favorite part about being in, or coming to, school, and why?

- Are you good at science? Why or why not?

- Do you think your classmates think you are good at science? Why or why not?

- Do you think your family thinks you are good at science? Why or why not?

- Do you have friends that do not go to school here?

- If so, do you think that your friends that do not go to school here think you are good at science? Why or why not?

- Do you think your teachers think you are good at science? Why or why not?

- Do you think you are smart? Why or why not?

- Is there anything that smart people typically do, say, think, or wear?

- What makes a smart person “smart”?

- How can you tell if a person is smart?

- Can you tell if a person is smart even if you do not know them, that is, can you tell if a person is smart just by the way they act, behave, dress, or speak? If so, how?

- Who do you think are the three best science students in your class? You may include yourself if you think that you are one of the three best science students in your class.

- What do the three best science students in your class share, or have in common, that makes them the best?

- In what ways are you similar to the three best science students in your class?

- In what ways are you different from the three best science students in your class?

- Who do you think are the three students in your class that have the most difficulty with science? You may include yourself if you think that you are one of these students.

- What do these three students in your class share, or have in common, that makes them have difficulty with science?

- In what ways are you similar to these three students in your class?

- In what ways are you different from these three students in your class?

- There are two classrooms in the fifth grade. Do you think these classrooms are more similar to one another or more different, and why?

- Do these two classrooms learn different things or at different speeds?

- Are the expectations of the students in one classroom different from the expectation of the students in the other classroom, and if so, how?

- Do you think that one classroom is smarter than the other classroom? If so, which one, and why do you think so?

- Do students talk about the two classrooms being different in any way, and if so, what kinds of things do they say?

- If you think that the two classroom are different in any way, do you think that it is a good thing or a bad thing, and why?

- Do you think that some students think that they are smart *because* they are in Miss Thorton's class? If so, who are these students?

- Do you think that some students think that they are not as smart *because* they are in Miss Weaver's class? If so, who are these students?

- Do you think that some students should be in Miss Thorton's class instead of Miss Weaver's class? If so, who are these students, and why do you think so?

- Do you think that some students should be in Miss Weaver's class instead of Miss Thorton's class? If so, who are these students, and why do you think so?

“Being a Science Student” Interview Protocol (Spanish)

- ¿Quieres ir a algún día a la universidad?

- ¿Por qué o por qué no quieres ir a la universidad?

- ¿Qué le gustaría estudiar en la universidad, y por qué?

- ¿A dónde le gustaría ir a la universidad?

- ¿Crees que tienes una buena o no tan buena oportunidad de ir a la universidad, y por qué?

- ¿Qué clase de trabajo te gustaría tener cuando seas adulto, y por qué?

- ¿El trabajo que usted desea se relaciona con la ciencia? Si es así, ¿Cómo?

- Imagine que conoce a alguien de otro planeta, y te dicen que ellos pueden leer algunas de nuestras palabras, pero que no tienen idea de lo que significan. Si esta persona se acercó a usted y le preguntó: "¿Qué es la ‘ciencia’?” ¿Qué le dirías?

- Si esta persona entonces le preguntó: "¿Quiénes son los científicos, y ¿qué hacen?" ¿Qué le dirías?

- Finalmente, si esta persona dijo, "Parece que los seres humanos utilizan la ciencia en el planeta, pero no estoy seguro de cómo o para qué. “¿Para qué utiliza la ciencia." ¿Qué le responderias?

- ¿Te gusta la ciencia? ¿Por qué o por qué no?

- ¿Qué esperan de ti tus profesores cuando tu estas aprendiendo sobre la ciencia, o practicando sobre la ciencia?

- ¿Crees que tus profesores tienen expectativas similares o diferentes cuando tu estas aprendiendo temas que no son de ciencia? Si es así, ¿Cómo?

- ¿Tienen algo en especial los estudiantes de ciencia—las cosas que hacen o dicen, su forma de actuar o de hablar y comportar, o de su imagen—que sea diferente a cualquier otro tipo de estudiantes (por ejemplo, los estudiantes de historia o de los estudiantes de matemáticas)?

- ¿Cuál es tu materia favorita en la escuela, y por qué?

- ¿Cuál es tu materia menos favorita en la escuela, y por qué?

- ¿En cuál materia te realizes mejor en la escuela, y por qué?

- ¿En cuál materia tienes más dificultad, y por qué?

- ¿Desde el comienzo de la jornada escolar, hasta el final de la jornada escolar, cuál es tu parte favorita de estar en la escuela y por qué?

- ¿Desde el comienzo de la jornada escolar, hasta el final de la jornada escolar, cuál es tu parte menos favorita de estar en la escuela, y por qué?

- ¿Eres excelente en la ciencia? ¿Por qué o por qué no?

- ¿Crees que tus compañeros piensan que eres excelente en la ciencia? ¿Por qué o por qué no?

- ¿Crees que tu familia piensa que eres excelente en la ciencia? ¿Por qué o por qué no?

- ¿Tienes amigos que no van a la escuela aquí?

- Si es así, ¿Crees que tus amigos que no vienen aquí a la escuela piensan que eres excelente en la ciencia? ¿Por qué o por qué no?

- ¿Crees que tus profesores piensan que eres excelente en la ciencia? ¿Por qué o por qué no?

- ¿Crees que eres inteligente? ¿Por qué o por qué no?

- ¿Hay algo que las personas inteligentes suelen hacer, decir, pensar, o tienen sierta forma de vestir?

- ¿Qué hace que una persona sea "inteligente"?

- ¿Cómo puedes saber si una persona es inteligente?

- ¿Se puede saber si una persona es inteligente, si usted no los conoce, es decir, se puede saber si una persona es inteligente sólo por la forma de actuar, comportar, vestir, o hablar? Si es así, ¿Cómo?

- ¿Quién crees que son los tres mejores estudiantes de ciencia en tu clase? Puedes incluirte a ti mismo si piensas que eres uno de los tres mejores estudiantes de ciencia de tu clase.

- ¿Qué caracteristicas comparten los tres mejores estudiantes en tu clase de ciencia, o que tienen en común, que los hace los mejores estudiantes?

- ¿De qué manera eres similar a los tres mejores estudiantes de ciencia de tu clase?

- ¿En qué manera eres diferente a los tres mejores estudiantes de ciencia de tu clase?

- ¿Quién crees que son los tres estudiantes en tu clase que tienen la mayor dificultad con la ciencia? Puedes incluirte a ti mismo si piensas que eres uno de estos estudiantes.

- ¿Qué tienen en común estos tres estudiantes de tu clase, que les hace tener dificultad con la ciencia?

- ¿En qué manera eres igual a estos tres estudiantes en tu clase?

- ¿De qué manera eres diferente a estos tres estudiantes en tu clase?

- Hay dos clases en el quinto grado. ¿Crees que estas aulas son más similares o más diferentes, y por qué?

- ¿Crees que las dos aulas aprenden las cosas diferentes y a diferentes ritmos?

- ¿Crees que las expectativas de los estudiantes en un salón de clases son diferentes a las expectativas de los estudiantes de otra clase, si es así, ¿Cómo?

- ¿Crees que una aula es más inteligente que otra aula? Si es así, ¿Cuál y por qué piensas eso?

- ¿Crees que los estudiantes de las dos aulas hablan de diferente manera, si es así, qué tipo de cosas es lo que dicen?

- Si piensas que las dos aulas son diferentes de alguna manera, ¿Crees que es algo positivo o negativo, y por qué?

- ¿Crees que algunos estudiantes piensan que son inteligentes porque están en la clase de la señorita Thorton? Si es así, ¿Quiénes son estos estudiantes?

- ¿Crees que algunos estudiantes piensan que no son tan inteligentes porque están en la clase de la señorita Weaver? Si es así, ¿Quiénes son estos estudiantes?

- ¿Crees que algunos estudiantes deben estar en la clase de la señorita Thorton en lugar de la clase de la señorita Weaver? Si es así, ¿Quiénes son estos estudiantes, y por qué lo crees así?

- ¿Crees que algunos estudiantes deben estar en la clase de la señorita Weaver en vez de la clase de la señorita Thorton? Si es así, ¿Quiénes son estos estudiantes, y por qué lo crees así?

“Draw a Science Person” (DASP) Interview Protocol (English)

*Each drawing (e.g., scientist, science teacher, college science student, and a person that uses science in their job other than a scientist, science teacher, or college science student) will be assessed equally and in the order listed above.

- Please describe your drawing to me.
- What is this person doing in your drawing and why are they doing that?
- How old is this person?
- Is this person male or female?
- What is this person’s skin color?
- What is this person’s name?
- What are this person’s hobbies, interests, or things they like to do for fun?
- Describe this person’s family, if they have one.
- Who is in this person’s family, and what do they do for work?
- Describe this person’s personality.
- What are the things, if any, that this person would not do?

After the above questions have been asked for each of the four drawings, I then asked:

- Of these four people, who are you most similar to, and why?
- Of these four people, who are you most dissimilar to, and why?
- What are your own hobbies, interests, or things you like to do for fun?
- Please describe your own personality.
- Please describe your own family.
- Who is in your family, and if you know, what do they do for work?

- Were your parents born here in the United States or elsewhere?

- What is the language used most often by your parents and/or in your home?

- Do you and your family speak English or Spanish more often when outside of your home?

- Do you and your family speak English or Spanish more often when inside of your home?

- If you have brothers and sisters, do you speak English or Spanish more often with them?

- Do you speak English or Spanish more often with your parents?

- Do you think it would be more helpful for you in school (i.e., to learn, to do well, etc.) if you were allowed to speak Spanish in class, and/or if your teachers were able to explain things to you in Spanish and English?

“Draw a Science Person” (DASP) Interview Protocol (Spanish)

*Each drawing (e.g., scientist, science teacher, college science student, and a person that uses science in their job other than a scientist, science teacher, or college science student) will be assessed equally and in the order listed above.

- Por favor, describeme tu dibujo.

- ¿Qué esta haciendo esta persona en tu dibujo y por qué hace eso?

- ¿Qué edad tiene esta persona?

- ¿Es esta persona mujer o hombre?

- ¿Qué es el color de la piel de esta persona?

- ¿Qué es el nombre de esta persona?

- ¿Qué son las aficiones de esta persona, intereses o cosas que les gusta hacer para divertirse?

- Describe la familia de esta persona, si la tiene.

- ¿Cuantas personas hay en la familia de esta persona, y qué clase de trabajo hacen?

- Describe la personalidad de esta persona.

- ¿Qué cosas, si alguna, esta persona no haría?

After the above questions have been asked for each of the four drawings, I then asked:

- ¿De estas cuatro personas, que es lo que más similar tienen de ti, y por qué lo crees?

- ¿De estas cuatro personas, que es lo que más diferente tienen de ti, y por qué lo crees?

- ¿Cuáles son tus aficiones, intereses, o las cosas que te gusta hacer para divertirte?

- Por favor describe tu propia personalidad.

- Por favor describe tu propia familia.

- ¿Cuantas personas hay en tu familia, y ¿Qué clase de trabajo hacen?

- ¿Dónde nacieron tus padres?

- ¿Cuál es el idioma que tus padres hablan con mayor frecuencia?

- ¿Qué idioma habla tu familia con más frecuencia cuando están afuera de tu casa?

- ¿Qué idioma habla tu familia con más frecuencia cuando están en casa?

- Con tus hermanos y hermanas, qué idioma hablas más con ellos, Inglés o Español?

- ¿Crees que sería más facil para ti en la escuela si te permitieran hablar Español en clase, y/o si tus profesores podieran explicarte las cosas en Español?

“Being a ‘Good’ Science Student” Rank-Order Exercise (English)

Miss Thorton’s Class (P_2)

Directions: Please rank the following terms below from most important to least important. Put a “1” next to what you think is the most important expectation of a “good” science student. Then, put a “2” next to the second most important expectation, and so on, until you have assigned a different number to every expectation below.

“Good” science students are expected to…

(_) be nice, kind, friendly, and polite

(_) be respectful

(_) be good listeners

(_) be well behaved and follow the rules

(_) be clever and creative

(_) be active and participate in class

(_) do experiments

(_) be funny

(_) be cool

(_) be smart

(_) dress nicely or wear nice clothes

(_) be awesome or excellent

(_) be honest

(_) be careful and safe

(_) act like a scientist

(_) look like a scientist

(_) be tall

(_) to wear glasses

(_) to focus and pay attention

(_) be happy and have fun

(_) help others

(_) be boys

(_) be girls

“Being a ‘Good’ Science Student” Rank-Order Exercise (English)

Miss Weaver’s Class (P_2)

Directions: Please rank the following terms below from most important to least important. Put a “1” next to what you think is the most important expectation of a “good” science student. Then, put a “2” next to the second most important expectation, and so on, until you have assigned a different number to every expectation below.

“Good” science students are expected to…

(_) be nice, kind, friendly, or polite

(_) get good grades

(_) be cool

(_) not talk back to teachers

(_) know a lot about science

(_) be well behaved and follow the rules

(_) be active and participate in class

(_) be good listeners

(_) be tall

(_) be good speakers

(_) build things and do experiments

(_) be smart

(_) be happy and have fun

(_) act like a scientist

(_) look like a scientist

(_) be funny

(_) dress nicely or wear nice clothes

(_) be boys

(_) be girls

“Being a ‘Good’ Science Student” Rank-Order Exercise (English)

Miss Thorton’s Class (P_3)

Directions: Please rank the following terms below from most important to least important. Put a “1” next to what you think is the most important expectation of a “good” science student. Then, put a “2” next to the second most important expectation, and so on, until you have assigned a different number to every expectation below.

“Good” science students are expected to…

(_) be friendly, kind, and nice

(_) be respectful

(_) listen

(_) pay attention

(_) follow the directions, instructions, and rules

(_) try their best

(_) be careful and safe

(_) be clever and creative

(_) not be mean

(_) be honest

(_) be responsible

(_) do experiments and projects

(_) not be rude

(_) be intelligent and smart

(_) be well behaved

(_) not talk during class and not talk back to teachers

(_) not fool around

(_) help others

(_) be teachable

(_) take good care of school supplies

(_) participate

(_) have fun

(_) be ready to learn

(_) be themselves

(_) not scream, shout, yell, or be loud

“Being a ‘Good’ Science Student” Rank-Order Exercise (English)

Miss Weaver’s Class (P_3)

Directions: Please rank the following terms below from most important to least important. Put a “1” next to what you think is the most important expectation of a “good” science student. Then, put a “2” next to the second most important expectation, and so on, until you have assigned a different number to every expectation below.

“Good” science students are expected to…

(_) be nice and kind

(_) be well behaved

(_) listen

(_) not talk during class or to back to teachers

(_) try their best

(_) follow the instructions and rules

(_) do all of their class work

(_) do all of their homework and hand it in

(_) be respectful

(_) be responsible

(_) learn

(_) pay attention

(_) study

(_) raise their hand

(_) be good at science

(_) not mess/play around during class

(_) participate

(_) work hard